An Apple (bark) a Day Keeps the Nephrologist Away

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Disclosures

- Consultant for George Clinical

Session Objectives

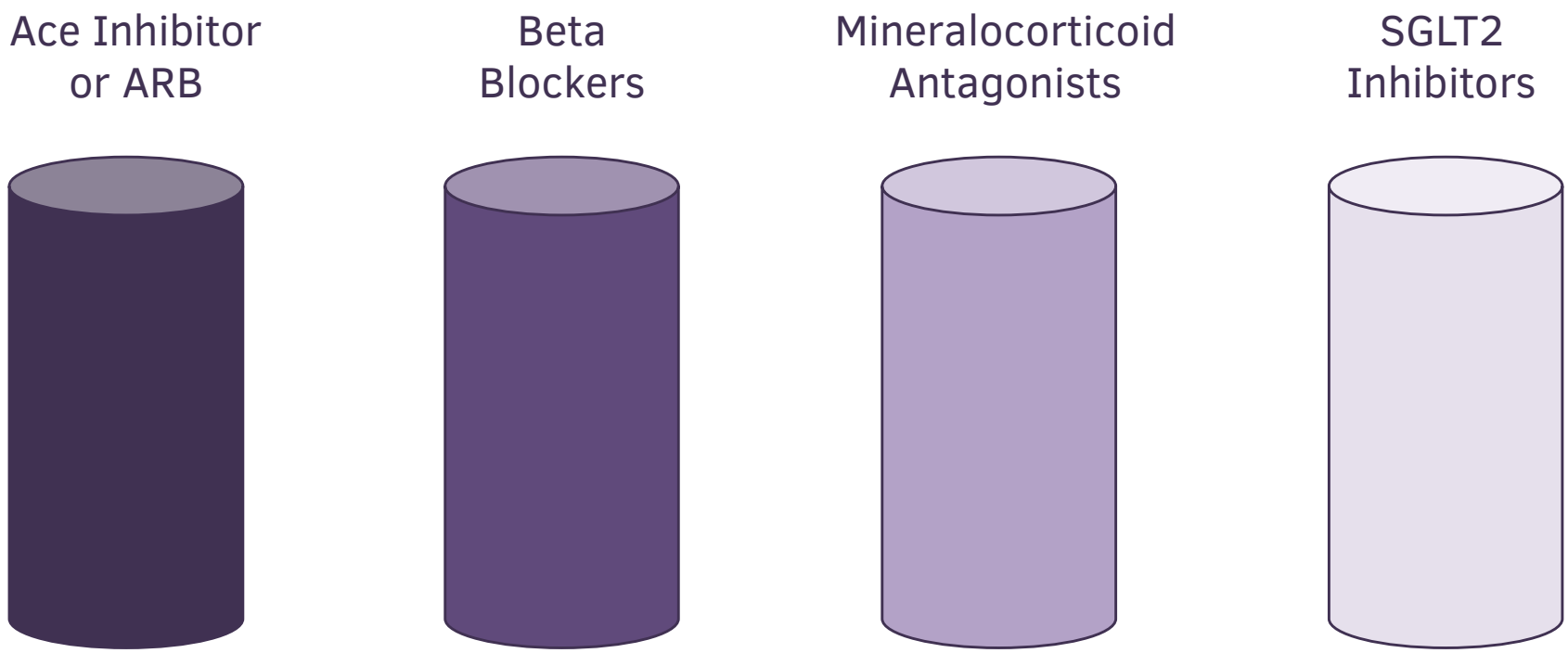
- Discuss and counsel patients on the benefits and common and rare side-effects of medications for CM and Renal disease.
- Describe the mechanism to achieve coverage based on expert use and experience for the new CM and renal medications.

A Nephrologists View of Diabetes

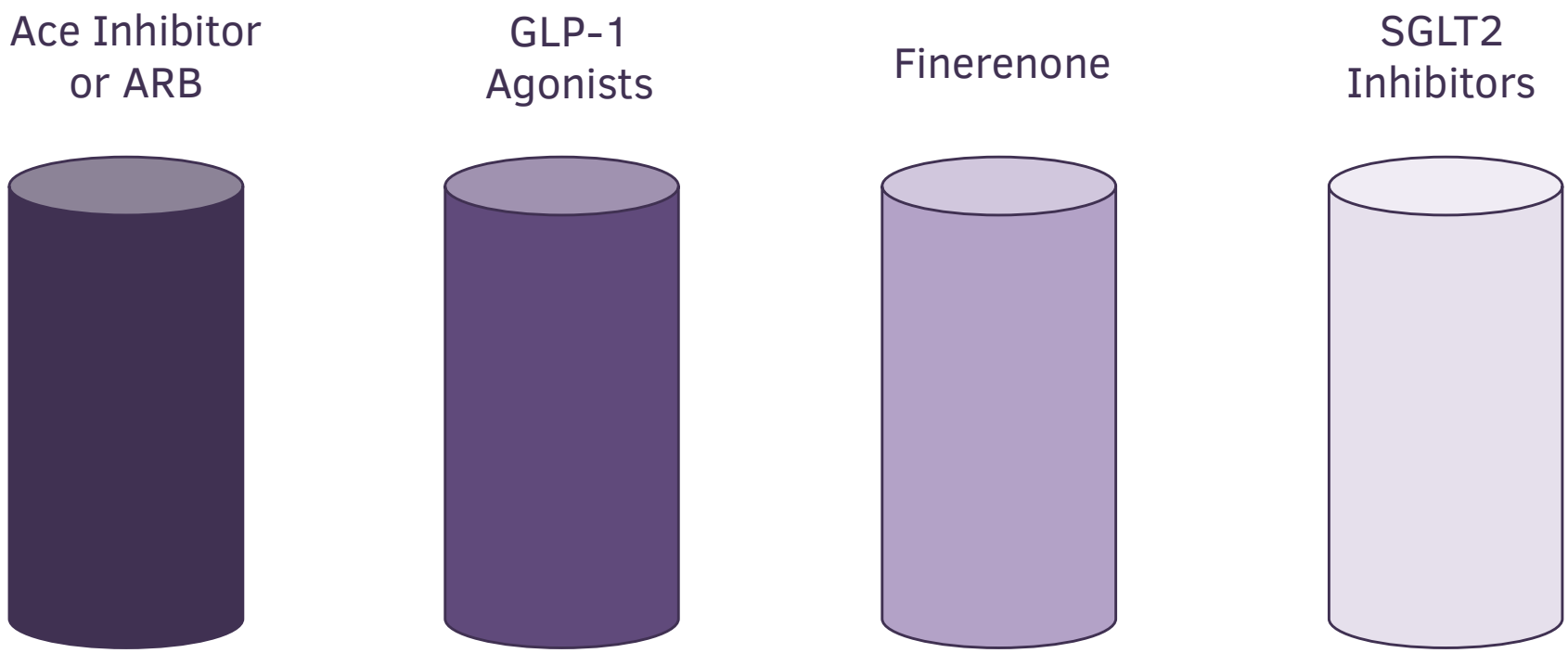
- Prevent progression of kidney disease
- Reduce cardiovascular events

- Glycemic Control
- Blood Pressure Management
- Albuminuria Reduction
- Medications

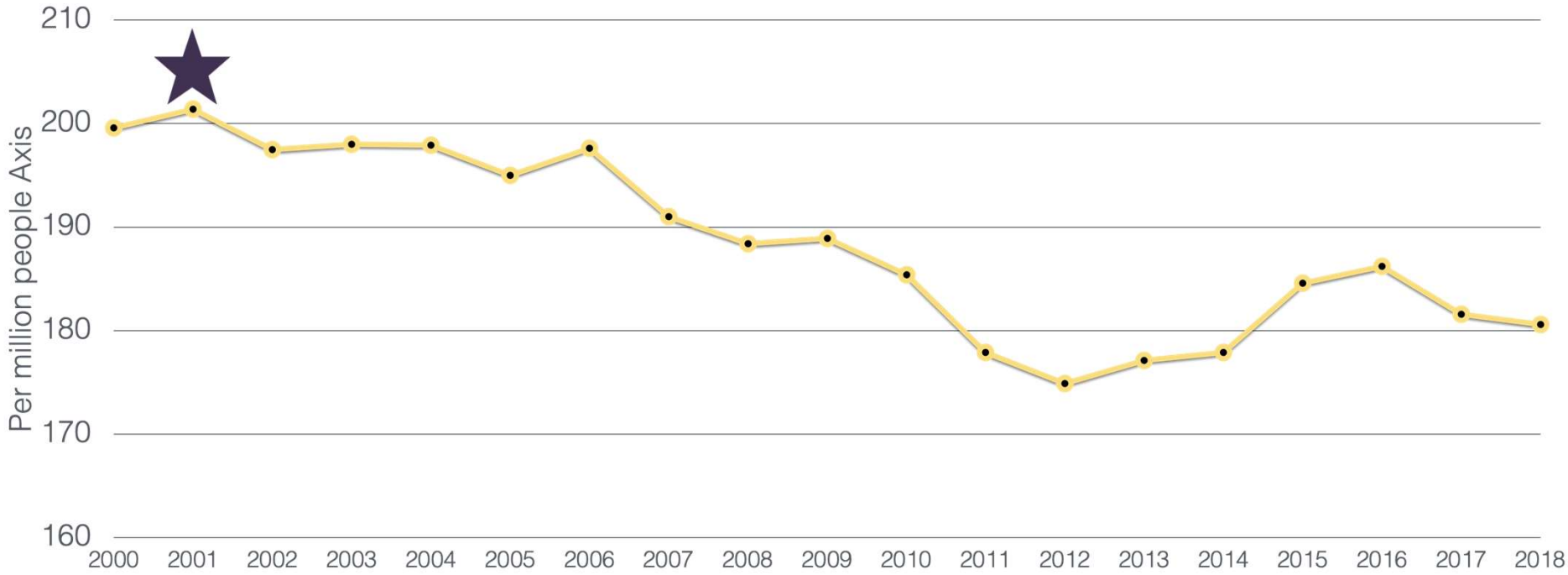
Diabetic Kidney Disease is the HFrEF for Nephrologists



Diabetic Kidney Disease is the HFrEF for Nephrologists



Incidence of KRT due to diabetes has improved!

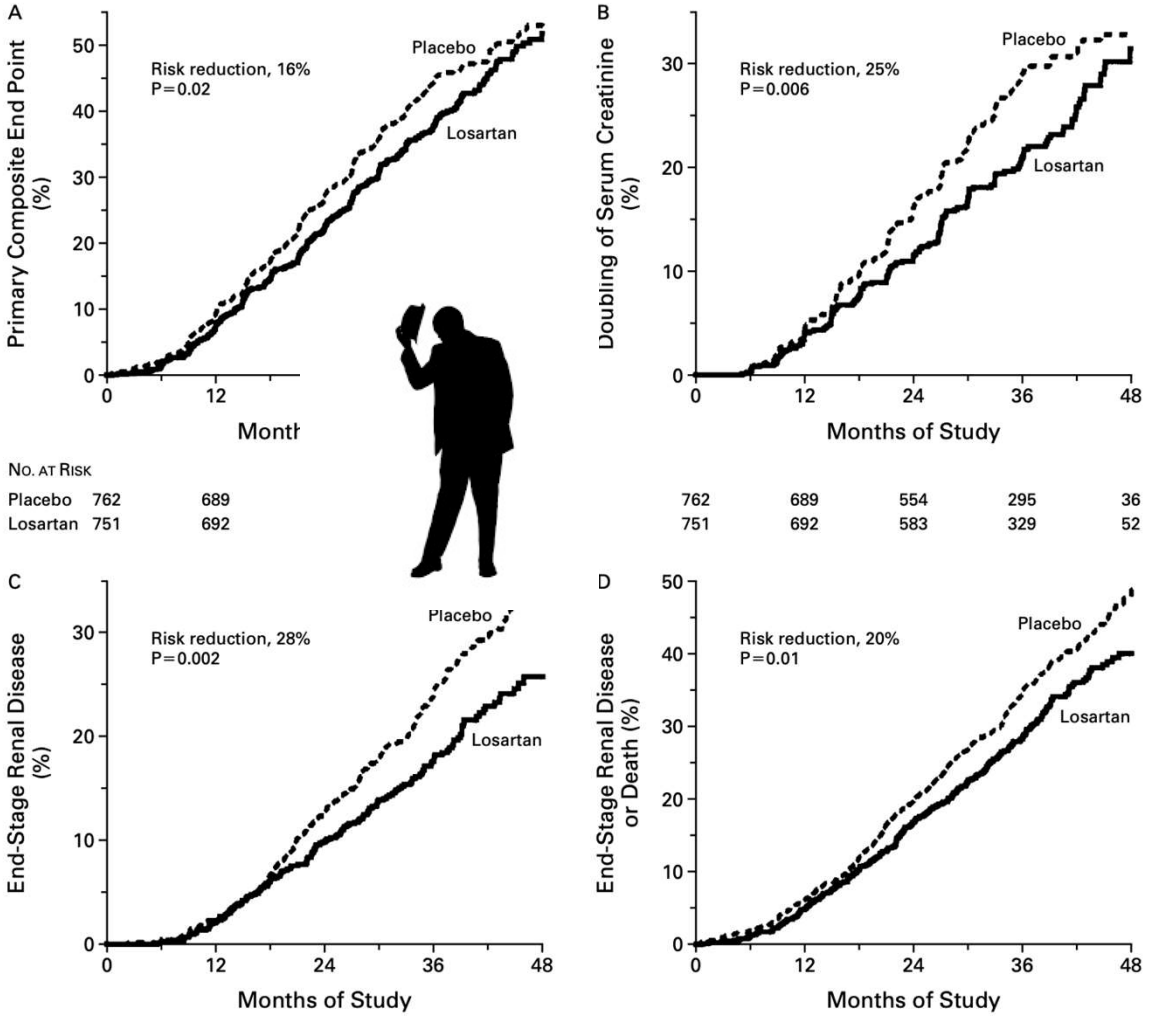


NHANES

The OG(s)

Brenner et al. NEJM. 2001

- Multicenter, double-blind, RCT
- N=1513
- Losartan v Placebo
- T2DM + CKD



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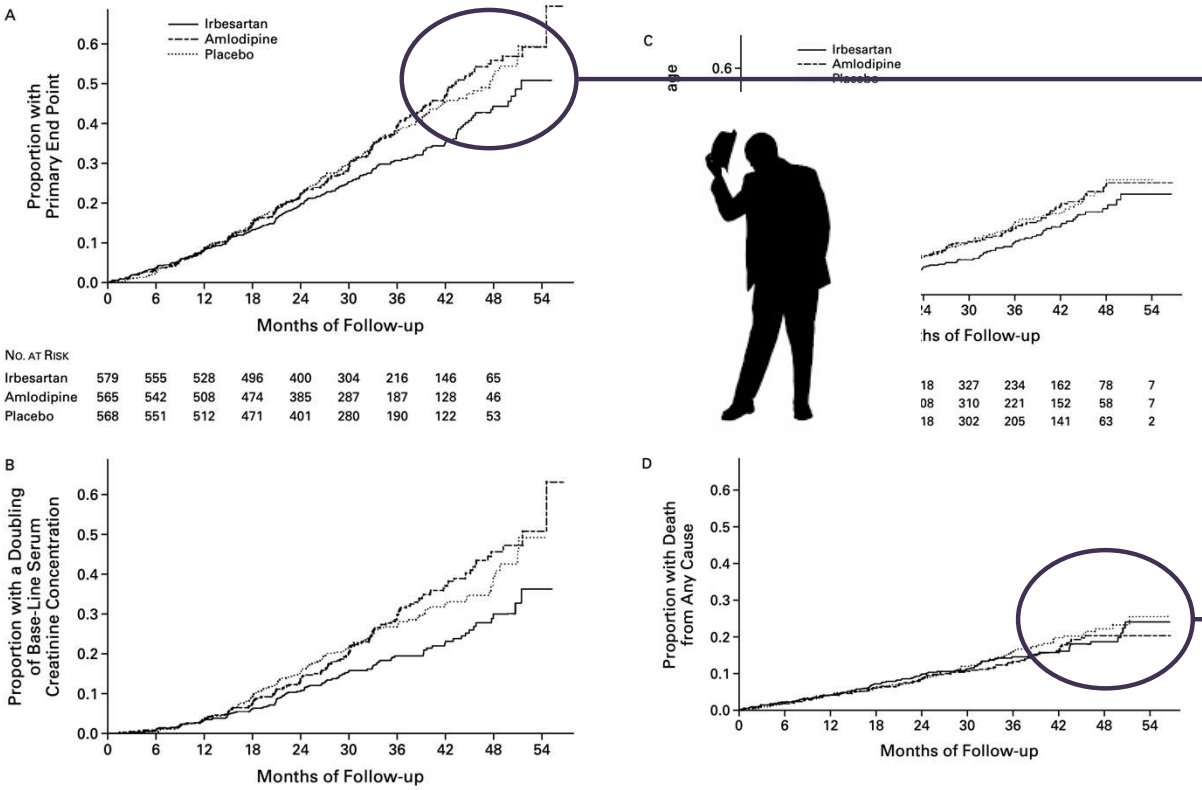
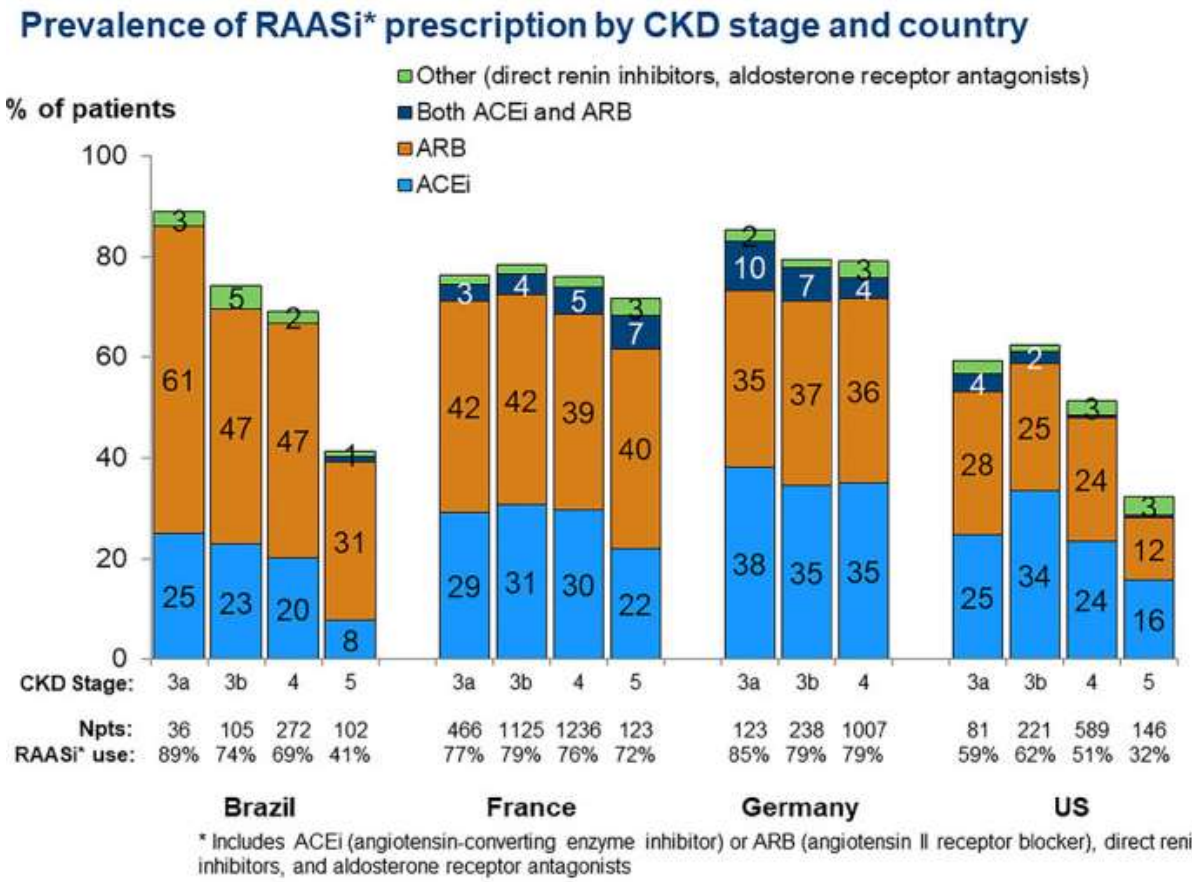


Relative Risk Reduction 20% vs placebo and 23% vs amlodipine. NNT 28 and 24.

No Mortality Benefit

Lewis et al. NEJM. 2001

We Can Do Better



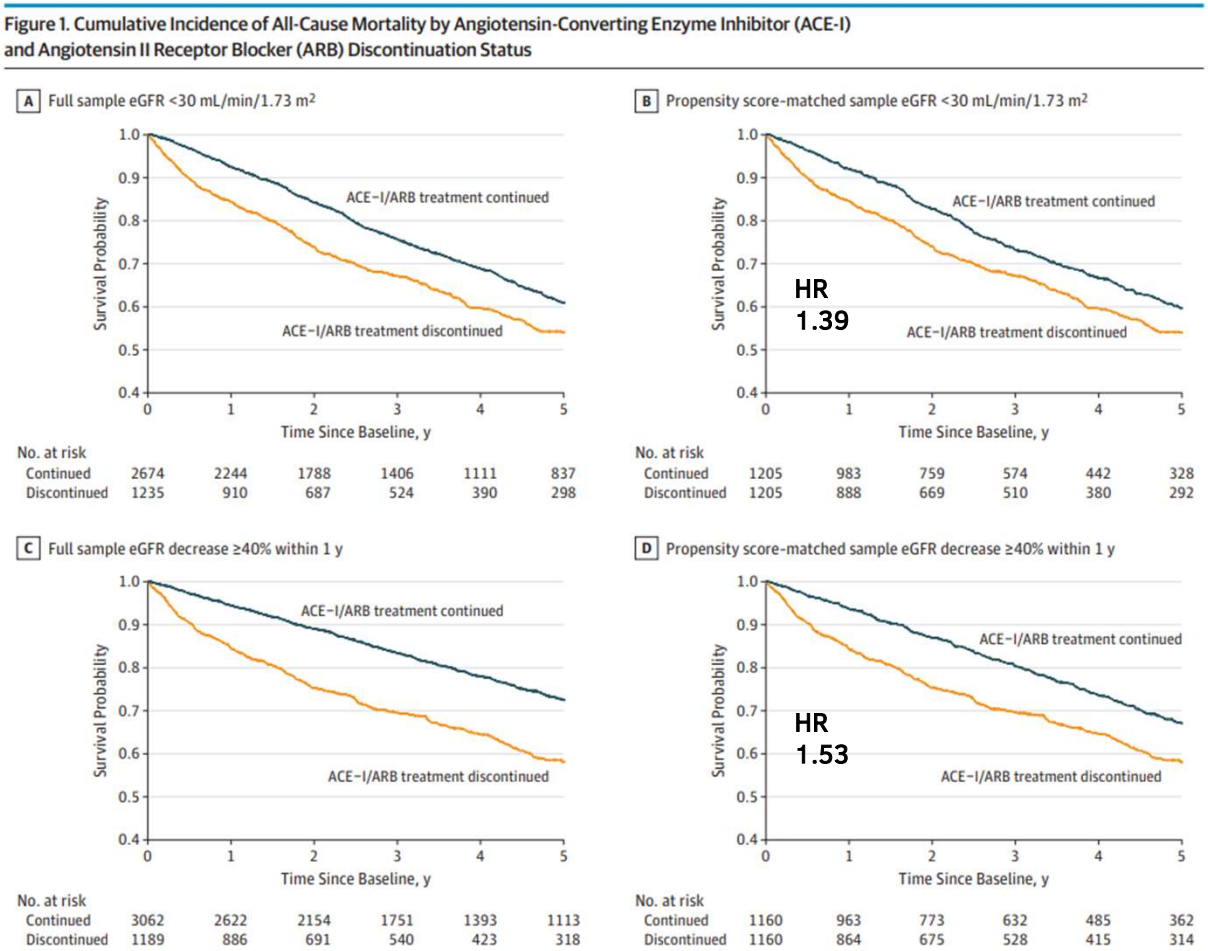
Pecoits-Filho et al. J Clin Hypertens. 2019

What We Know

Qiao et al. JAMA Intern Med. 2020

- Retrospective Propensity matched cohort
- Integrated Pennsylvanian health system 2004-2018
- N=3909, 2410 Propensity matched
- Stopping or continuing RASi w/in

  6 months of CKD 4 progression



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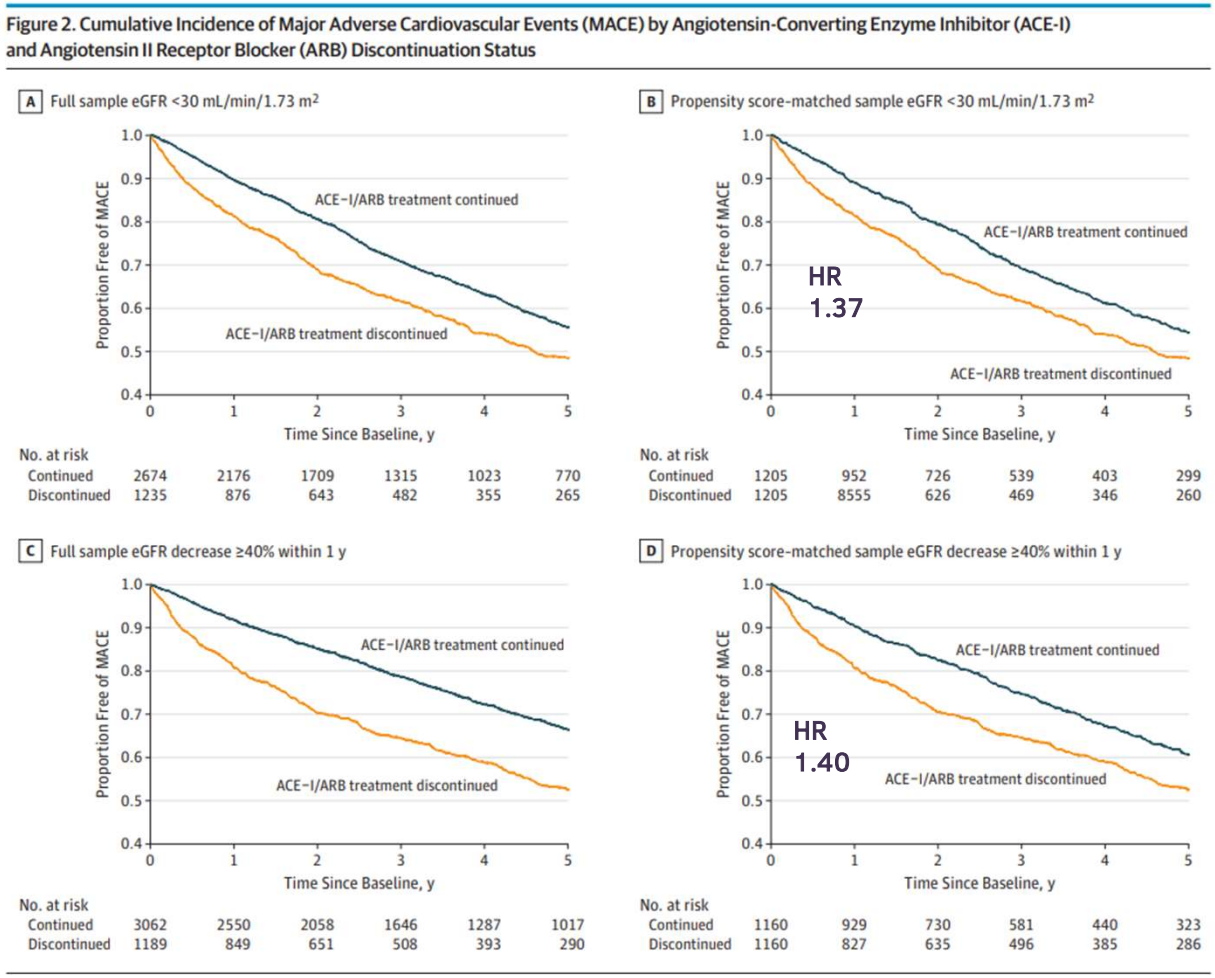

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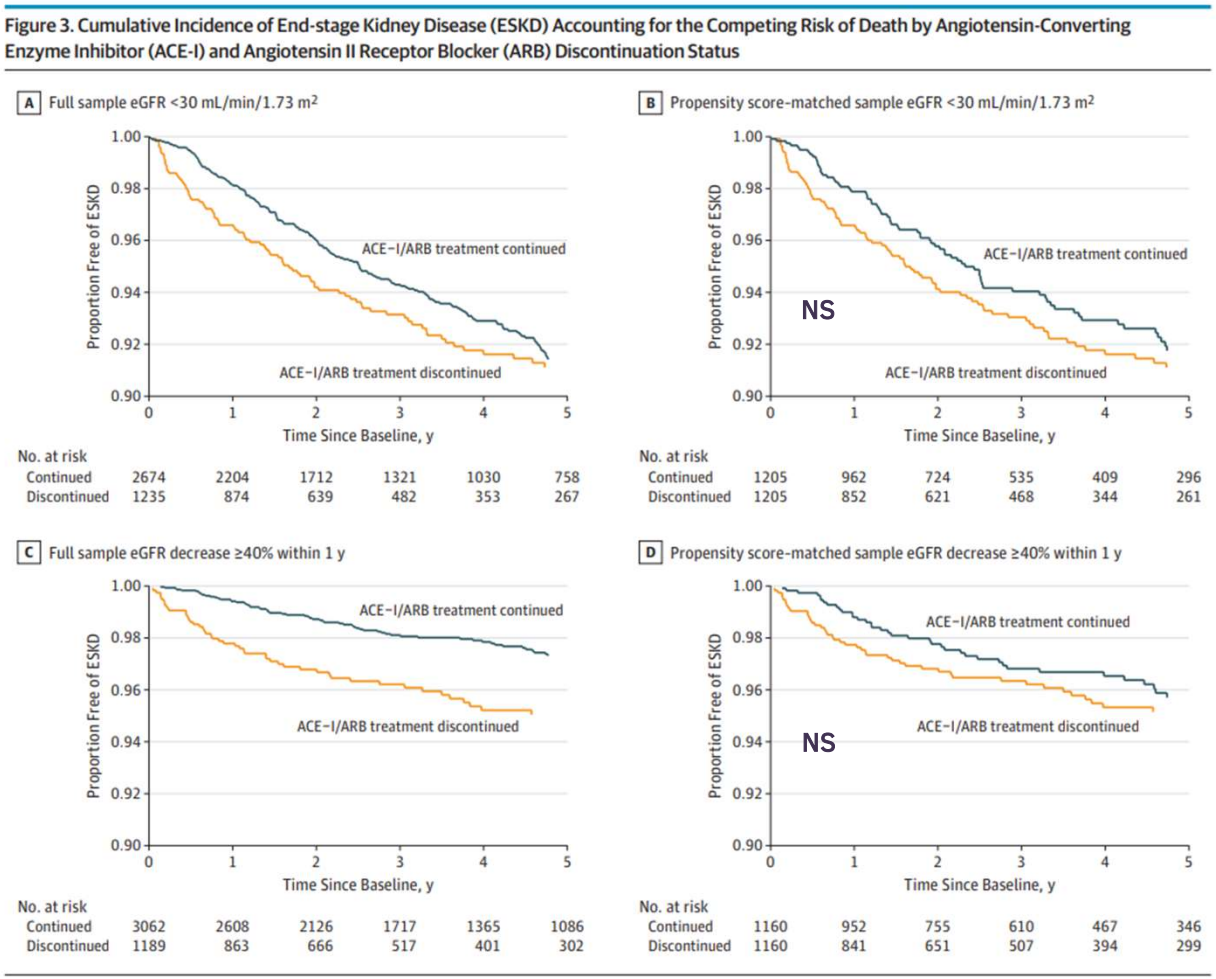

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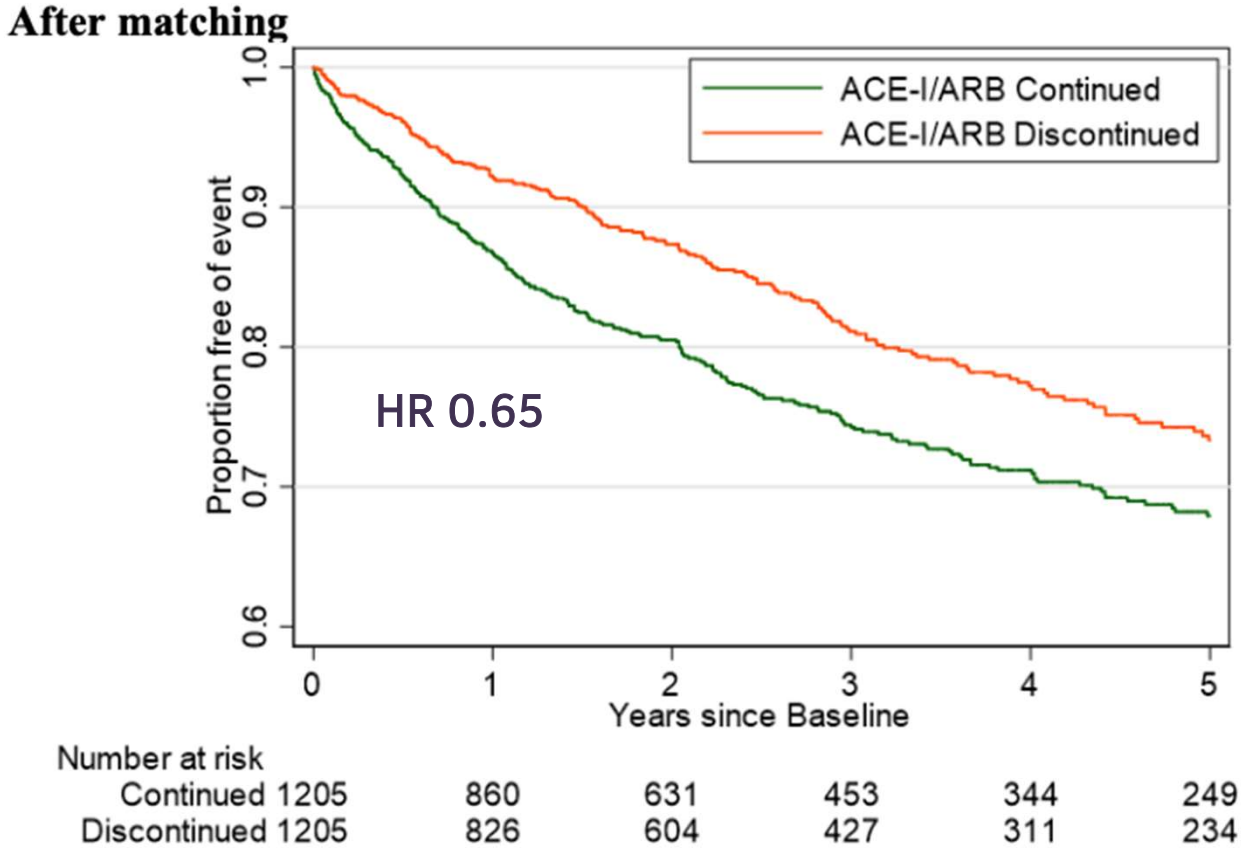


Hyperkalemia, RAS Inhibitors and Heart Failure

Rossignol et al. Eur J Heart Fail. 2020

- European Heart Failure Registry
- N=9222 – 31 countries
- 16.5% with HFpEF
- Assessed association between hyperkalemia and RASi use
- Median follow up 371 days

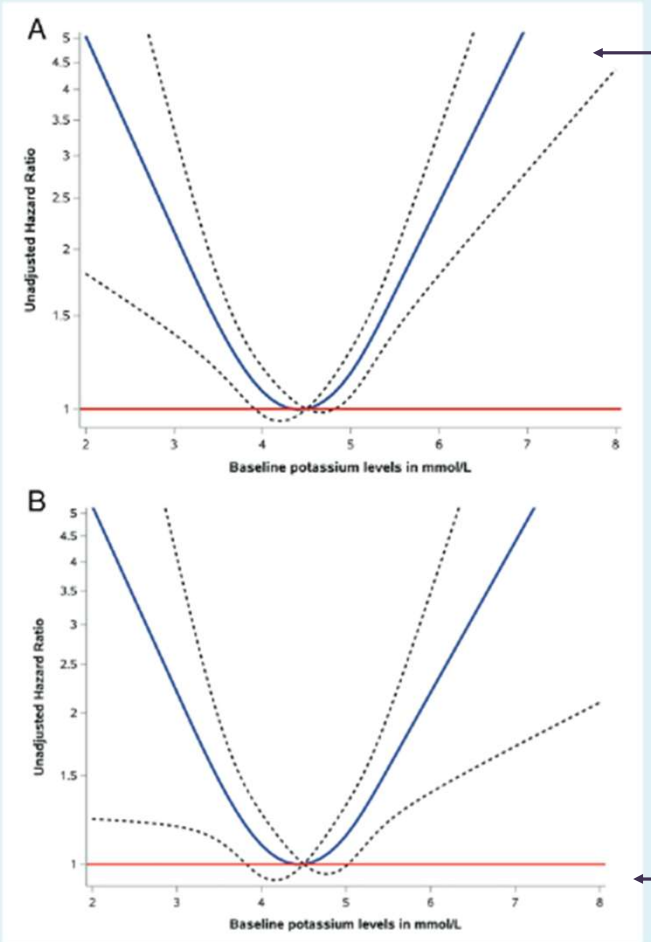


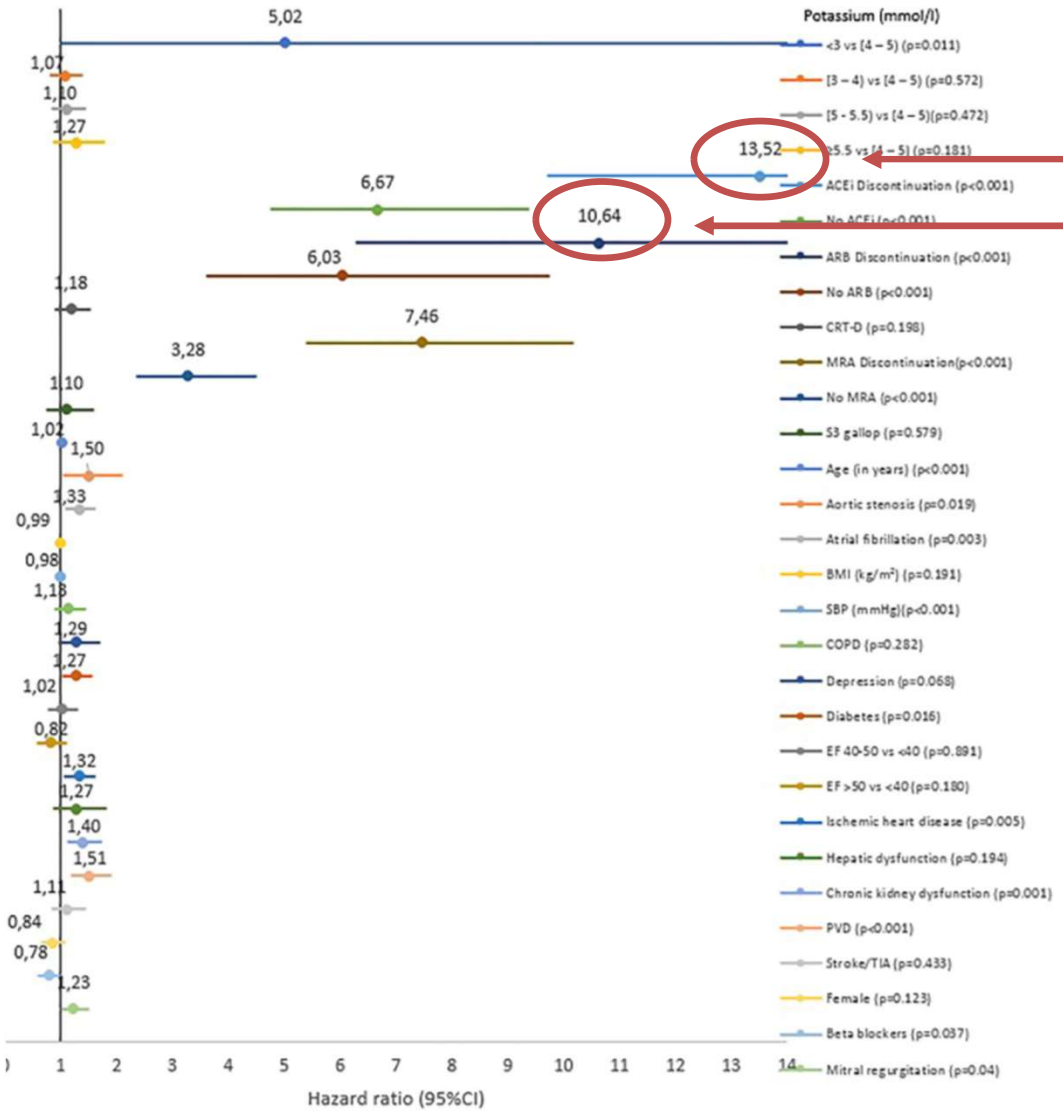
Figure 3 (*A*) Relationship between baseline serum potassium and 1-year all-cause death – natural cubic spline without adjustment. (*B*) Relationship between baseline serum potassium and 1-year cardiovascular death – natural cubic spline without adjustment.

All-cause mortality

CV mortality

U-shaped curve

Relationship between serum potassium and 1 year mortality



ACEi discontinuation

ARB discontinuation

Hyperkalemia no longer associated with mortality when adjusting for RASi discontinuation

Rossignol et al. Eur J Heart Fail. 2020

No Proteinuria: No Benefit

RESEARCH

OPEN ACCESS

Diabetes mellitus as a compelling indication for use of renin angiotensin system blockers: systematic review and meta-analysis of randomized trials

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ABSTRACT

OBJECTIVE
To evaluate the outcomes with use of renin angiotensin system (RAS) blockers compared with other antihypertensive agents in people with diabetes.

DESIGN
Meta-analysis.

DATA SOURCES AND STUDY SELECTION
PubMed, Embase, and the Cochrane central register of controlled trials databases for randomized trials of RAS blockers versus other antihypertensive agents in people with diabetes mellitus. Outcomes were death, cardiovascular death, myocardial infarction, angina, stroke, heart failure, revascularization, and end stage renal disease.

RESULTS
The search yielded 19 randomized controlled trials that enrolled 25 414 participants with diabetes for a total of 95 910 patient years of follow-up. When compared with other antihypertensive agents, RAS blockers were associated with a similar risk of death (relative risk 0.99, 95% confidence interval 0.93 to 1.05), cardiovascular death (1.02, 0.83 to 1.24), myocardial infarction (0.87, 0.64 to 1.18), angina pectoris (0.80, 0.58 to 1.11), stroke (1.04, 0.92 to 1.17), heart failure (0.90, 0.76 to 1.07), and revascularization (0.97, 0.77 to 1.22). There was also no difference in the hard renal outcome of end stage renal disease (0.99, 0.78 to 1.28) (power of 94% to show a 23% reduction in end stage renal disease).

CONCLUSIONS
In people with diabetes, RAS blockers are not superior to other antihypertensive drug classes such as thiazides, calcium channel blockers, and β blockers at reducing the risk of hard cardiovascular and renal endpoints. These findings support the recommendations of the guidelines of the European Society of Cardiology/European Society of Hypertension and eighth Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure to also use other antihypertensive agents in people with diabetes but without kidney disease.

Introduction
People with diabetes are at increased risk of cardiovascular and renal events.[1] Early placebo controlled trials (such as the Heart Outcomes Prevention Evaluation and European Trial on Reduction of Cardiac Events With Perindopril in Stable Coronary Artery Disease) have shown significant benefits from use of renin angiotensin system (RAS) blockers on cardiovascular and renal events in people with diabetes, benefits touted to be independent of the drugs blood pressure lowering efficacy. As such, the 2015 American Diabetes Association guidelines recommend RAS blockers (angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs)) as first line treatment for people with diabetes and hypertension.[2] Similarly, the 2013 American Society of Hypertension/International Society of Hypertension guidelines favor RAS blockers as a first line treatment in people with diabetes.[3] The National Kidney Foundation-Kidney Disease Outcomes Quality Initiative clinical practice guidelines state in its executive summary that "Hypertensive people with diabetes and chronic kidney disease stages 1-4 should be treated with an ACE inhibitor or an ARB, usually in combination with a diuretic."[4] In contrast, the 2013 European Society of Cardiology/European Society of Hypertension guidelines[5] and the 2014 evidence based guide-

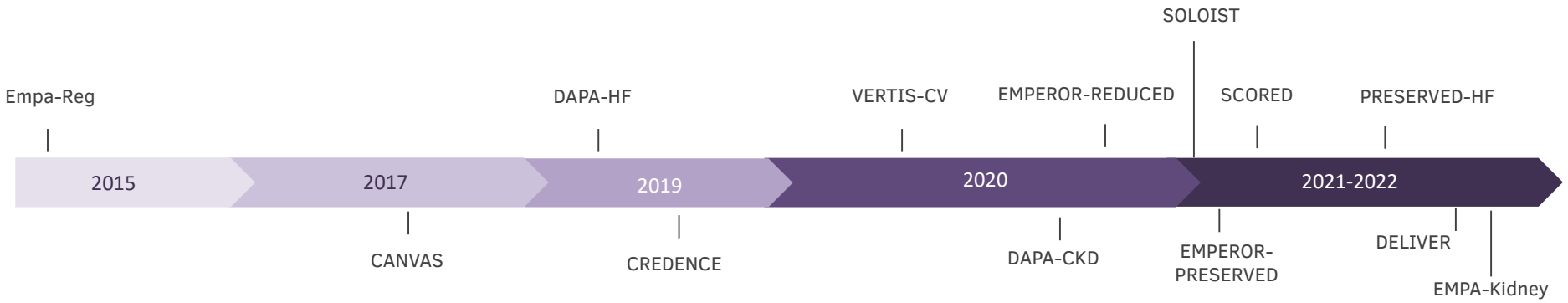
Conclusions

This analysis of head to head comparison trials of RAS blockers versus other antihypertensive agents in people with diabetes (and largely without microalbuminuria or proteinuria) failed to show a superiority of RAS blockers compared with other antihypertensive agents for the prevention of hard outcomes. The results support the recommendation of both the 2013 European Society of Cardiology/European Society of Hypertension guidelines[5] and the 2014 eighth report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure[6] that any class of antihypertensive agents can be used in people with diabetes especially in those without renal impairment.

Flozins

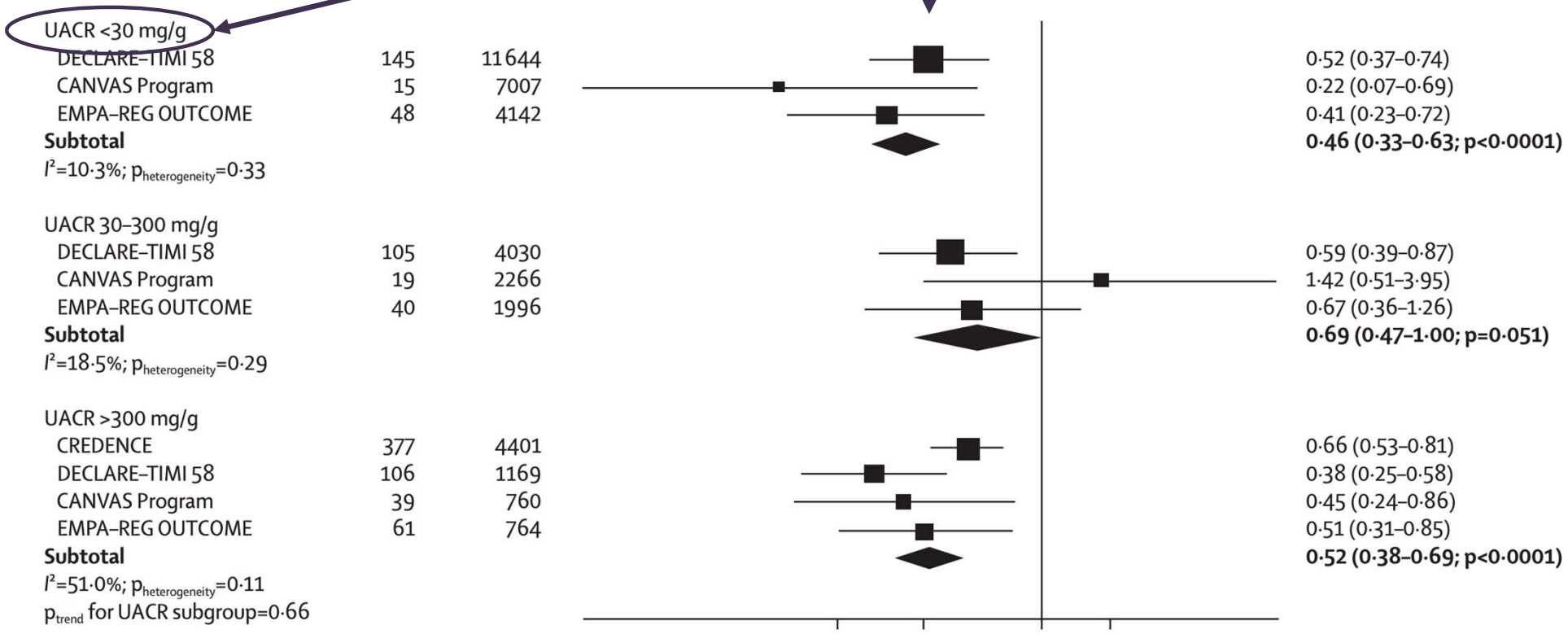
Some of the most powerful cardiorenal medications that have the side effect of lowering blood sugar

SGLT2 Inhibitor Trials

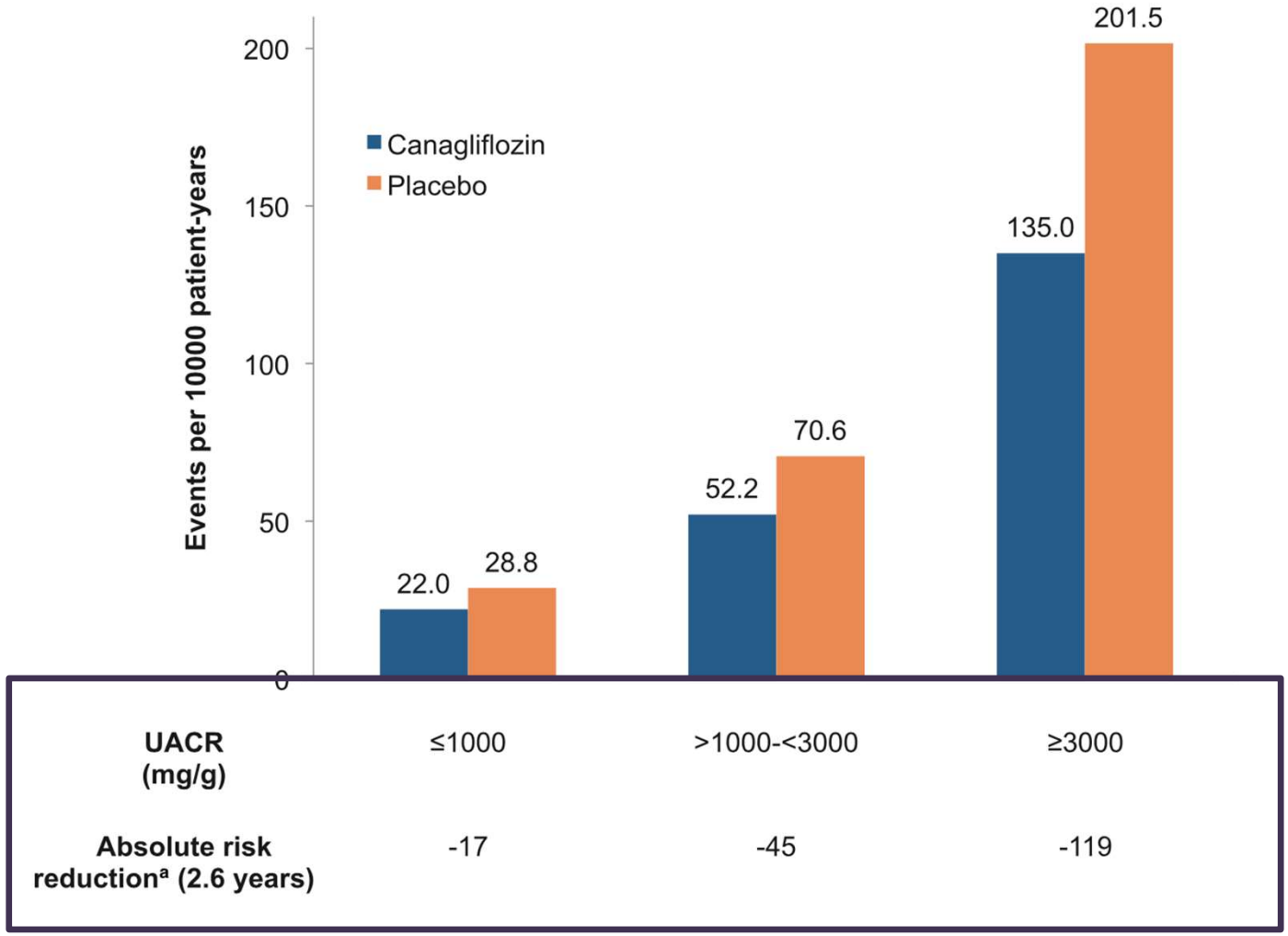


Patient Selection

SGLT2is works in the absence of albuminuria!



Neuen et al. Lancet Diabetes Endocrinol. 2019



UACR (mg/g)	≤1000	>1000-<3000	≥3000
Absolute risk reduction[a] (2.6 years)	-17	-45	-119

Neuen et al.NDT. 2020

IDNT Placebo 6.5

15.4% Irbesartan 5.5

RENAAL Placebo 5.2

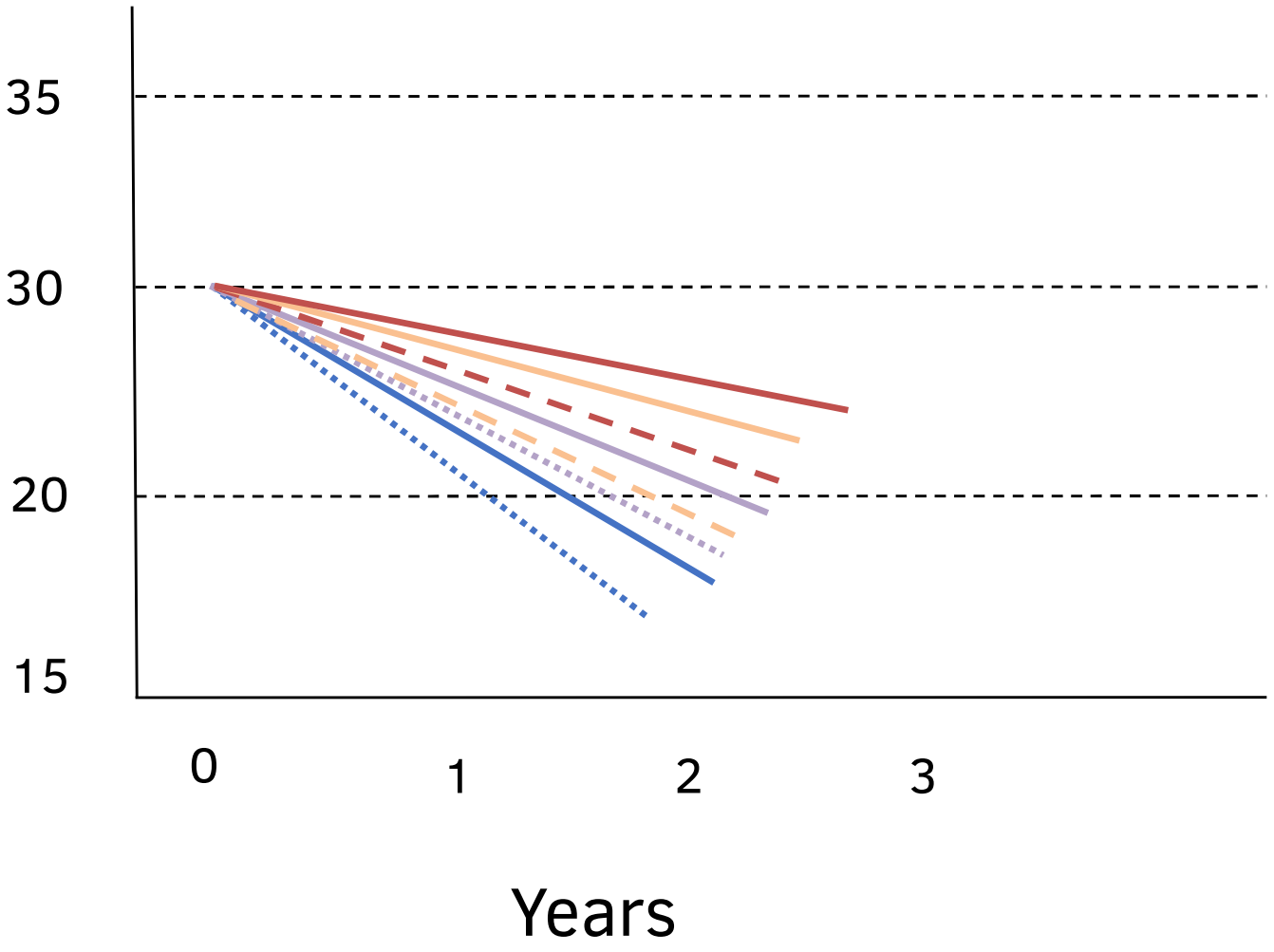
15.4% Losartan 4.4

CREDENCE Placebo 4.7

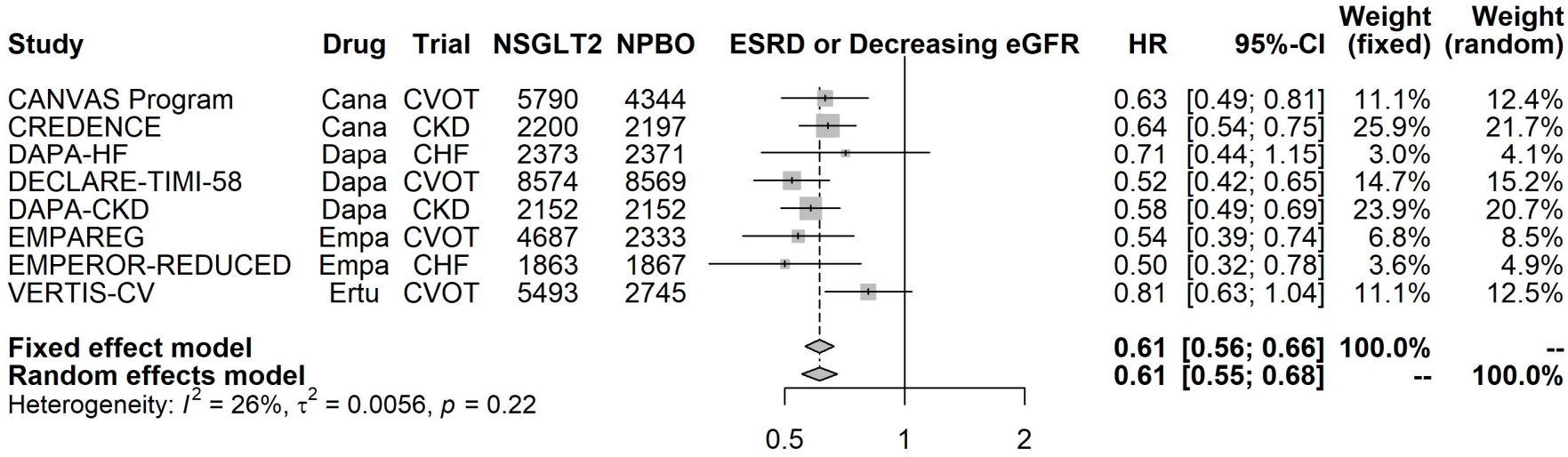
31.9% Cana 3.2

DAPA-Kidney Placebo 3.8

23.7% Dapa 2.9



Worsening Kidney Function or ESKD

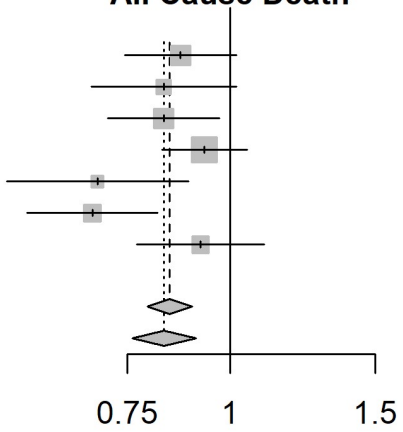


Neuen et al. Lancet Diabetes Endocrinol. 2019

All Cause Mortality

Study	Drug	Trial	NSGLT2	NPBO	HR	95%-CI	Weight (fixed)	Weight (random)
CANVAS Program	Cana	CVOT	5790	4344	0.87	[0.74; 1.02]	16.2%	16.0%
CREDENCE	Cana	CKD	2200	2197	0.83	[0.68; 1.02]	9.5%	11.9%
DAPA-HF	Dapa	CHF	2373	2371	0.83	[0.71; 0.97]	16.1%	15.9%
DECLARE-TIMI-58	Dapa	CVOT	8574	8569	0.93	[0.83; 1.05]	27.8%	20.0%
DAPA-CKD	Dapa	CKD	2152	2152	0.69	[0.54; 0.89]	6.1%	8.9%
EMPAREG	Empa	CVOT	4687	2333	0.68	[0.57; 0.82]	11.9%	13.6%
EMPEROR-REDUCED	Empa	CHF	1863	1867	0.92	[0.77; 1.10]	12.3%	13.8%
Fixed effect model					**0.84**	**[0.79; 0.90]**	**100.0%**	**--**
Random effects model					**0.83**	**[0.76; 0.91]**	**--**	**100.0%**

Heterogeneity: I^2 = 48%, τ^2 = 0.0067, p = 0.07



Neuen et al. Lancet Diabetes Endocrinol. 2019

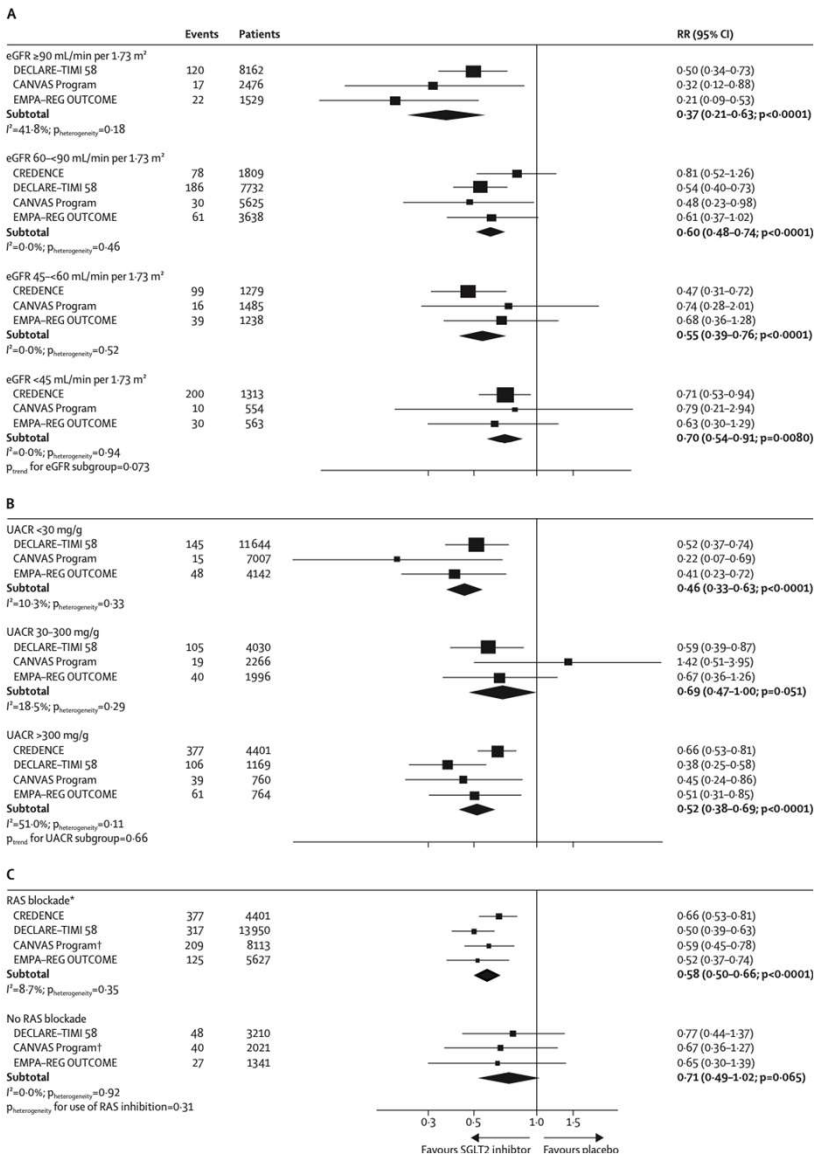
SGLT2i vs ARBs

	SGLT2i	ARB
All Cause Mortality	**0.76**	0.97
Composite Kidney Outcome	**0.61**	0.75
Effect on ESKD	0.80	0.77
HF Hospitalization	0.69	0.73

Neuen et al. Lancet Diabetes Endocrinol. 2019

Works Across GFRs

Neuen et al. Lancet Diabetes Endocrinol. 2019



Diabetes

Monitor HbA1c
POC Glucose
Mixing oral and injectable medications
Dealing with side effects

Blood Pressure

Home Blood Pressures
ABPM
Electrolyte and Kidney Function Monitoring

Cholesterol

Targeting LDL, Apo B, non-HDL
Adjusting between normal and high intensity statins
Screening for myalgias, LFTs

SGLT2 Inhibitors

Start the medicine.

What's your Threshold?

30 mL/min/1.73m^2	CANVAS EMPA CREDENCE
25 mL/min/1.73m^2	DAPA-CKD
20 mL/min/1.73m^2	EMPEROR-REDUCED EMPA-KIDNEY
45 mL/min/1.73m^2	Threshold for anti-glycemic effect

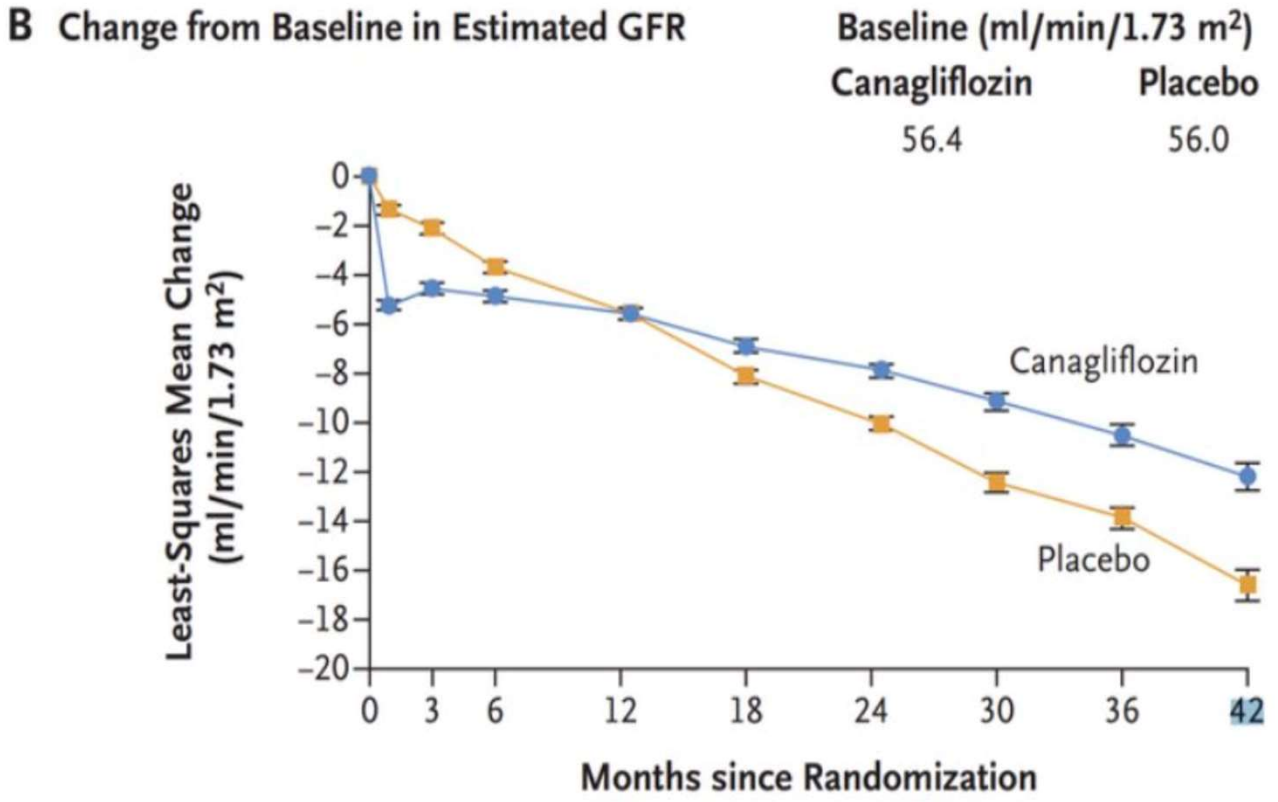
Continue until dialysis… or later?

"Furthermore, in the DAPA-CKD trial patients continued to use dapagliflozin or placebo when dialysis was initiated. In the subgroup of patients who initiated dialysis, dapagliflozin was associated with a relative risk reduction for mortality of 21%"

RENAL LIFECYCLE Trial

1500 patients
CKD4
Dialysis (500cc urine output/day)
Transplant (eGFR<45)

Dapagliflozin 10mg v placebo

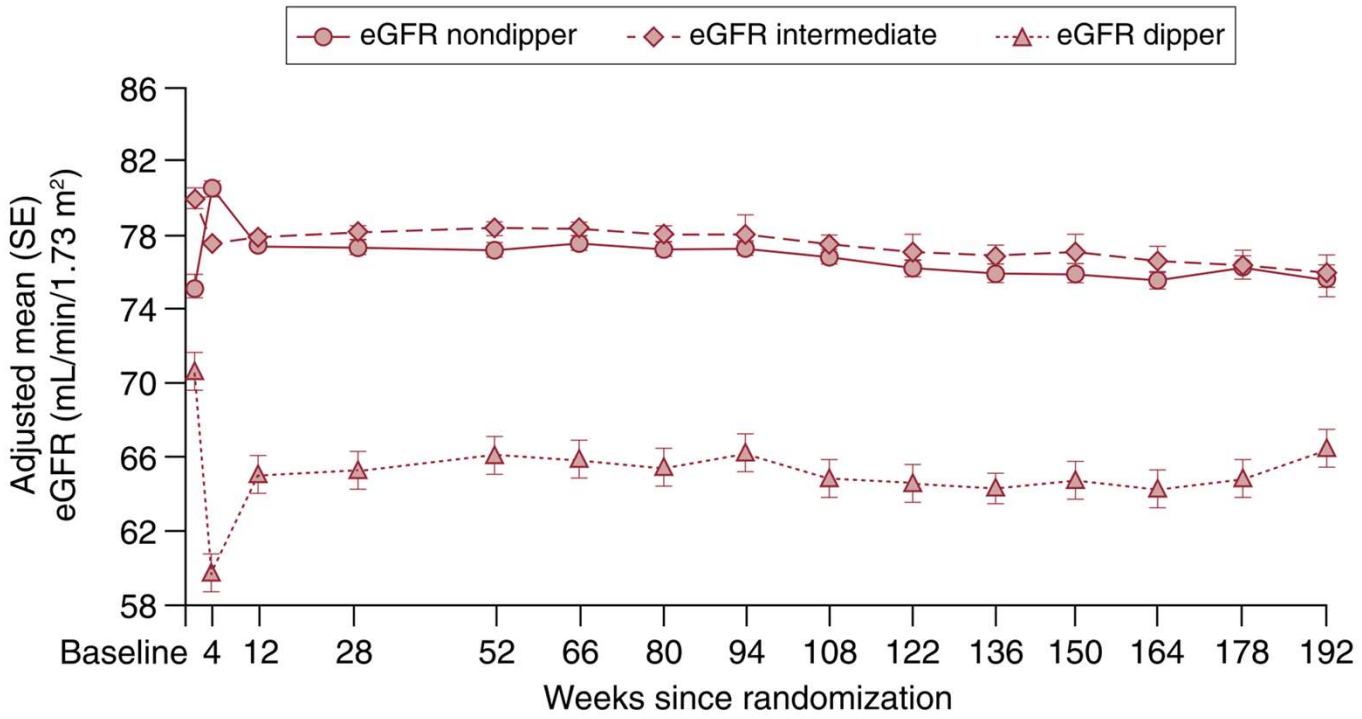


No. of Patients								
Placebo	2178	1985	1882	1720	1536	1006	583	210
Canagliflozin	2179	2005	1919	1782	1648	1116	652	241

Neal et al. NEJM. 2017

But the creatinine went up!

EMPA-Reg: 28% with a >10% drop in eGFR
30% drop in 0.5%
Risk Factors: lower GFR, more proteinuria and **concomitant diuretic use**



Neal et al. NEJM. 2017

Some Practical Advice

The greater the hyperglycemia the greater the osmotic diuresis. A HbA1c of >12% was exclusion criteria for the major trials.

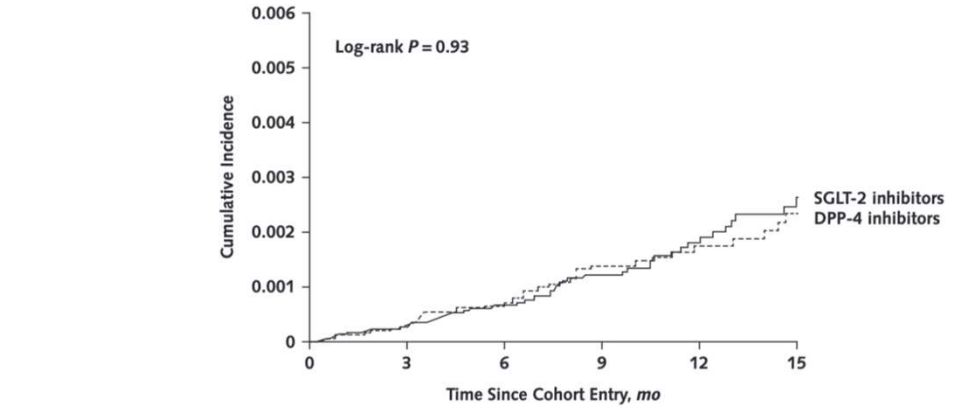
These are the most powerful drugs we have. Don't turn patients off, wait for better glycemic control.

Flozins potentiate the loop diuretic effect by 20%

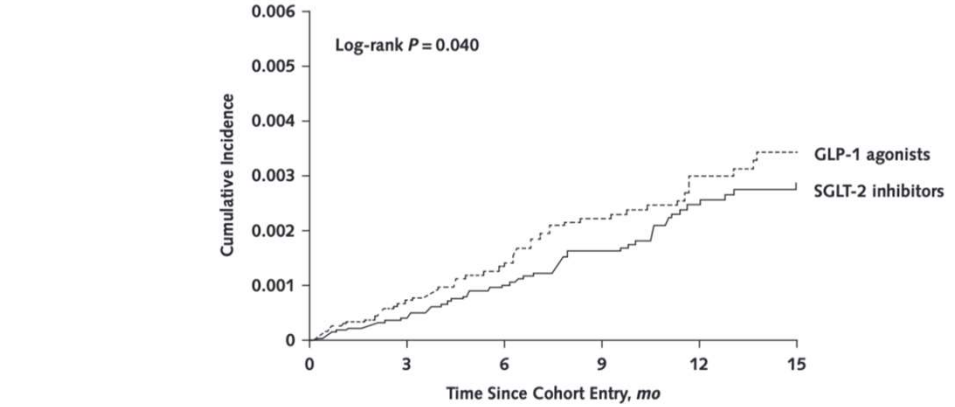
Risk of UTIs

Dave et al. Annals Intern Med. 2019

- US Based Databased of Commercial Claims
- 2013-2015
- Cohort 1: SGLT2i v DPP4i (n=123,752)
- Cohort 2: SGLT2i v GLP1a (n=111,978)
- Propensity Matched



At risk, *n*						
Receiving DPP-4 inhibitor	61 876	44 268	30 983	20 951	13 675	8679
Receiving SGLT-2 inhibitor	61 876	45 804	32 513	22 800	15 280	9405



At risk, *n*						
Receiving GLP-1 agonist	55 989	40 032	28 219	20 305	14 648	10 088
Receiving SGLT-2 inhibitor	55 989	42 276	30 099	22 642	16 745	11 387

Genital Myotic Infections

~ 2 – 4-fold increased risk

Generally easily treated with topical antifungals or occasionally fluconazole

Rarely leads to permanent drug cessation

Diabetic Ketoacidosis

	SGLT2i (%)	Placebo (%)	Hazard Ratio/Risk difference (vs placebo)	P Value
Credence n=4401	11 (0.22)	1 (0.02)	RR 10.80 (1.39, 83.65)	
EMPA-REG n=7.020	4 (0.1)	1 (<0.1)	RR 1.99 (0.22, 17.80)	
CANVAS n=10,142	0.06	0.03	HR 2.33 (0.76, 7.17)	0.14
DECLARE n=17143	27 (0.3)	12 (0.1)	RR 2.18 (1.10, 4.30)	0.02
VERTIS CV n=8238	19 (0.3)	2 (0.1)		
EMPEROR Reduced n=3726	0 (0.0)	0 (0.0)		
DAPA-HF n=4744	3 (0.1)	0 (0.0)		NA
DAPA CKD n=4298	0	2 (<0.1)		0.50

50,000 new prescriptions for SGLT2i
90,000 new prescriptions for DPP4i

Table 1. Characteristics of the Patients at Baseline.*

Characteristic	DPP4 Inhibitor (N=38,045)	SGLT2 Inhibitor (N=38,045)
Age — yr	54.4±10.8	54.8±9.4
Male sex — no. (%)	20,074 (52.8)	20,051 (52.7)
Clinical condition — no. (%)		
Diabetic nephropathy	1,374 (3.6)	1,430 (3.8)
Diabetic retinopathy	1,508 (4.0)	1,534 (4.0)
Diabetic neuropathy	3,252 (8.5)	3,257 (8.6)
Hypertension	24,464 (64.3)	24,576 (64.6)
Stroke	772 (2.0)	830 (2.2)
Coronary artery disease	3,280 (8.6)	3,338 (8.8)
Nondiabetic renal disease	1,965 (5.2)	2,034 (5.3)
Chronic obstructive pulmonary disease	376 (1.0)	378 (1.0)
Recent pneumonia	432 (1.1)	448 (1.2)
Medication use		
No. of all medications	6.0±4.1	6.0±3.9
No. of diabetes medications	3.3±3.3	3.2±3.3
Metformin — no. (%)	24,266 (63.8)	24,012 (63.1)
Sulfonylurea — no. (%)	12,557 (33.0)	12,300 (32.3)
Insulin — no. (%)	8,446 (22.2)	8,760 (23.0)
GLP1 receptor agonist — no. (%)	2,515 (6.6)	2,701 (7.1)
Visit to an endocrinologist within 30 days — no. (%)	4,126 (10.8)	4,158 (10.9)
Visit to emergency department within 180 days — no. (%)	4,422 (11.6)	4,463 (11.7)
Hospitalization within 30 days — no. (%)	296 (0.8)	335 (0.9)

First 180 days of a new RX

Unadjusted

SGLT2i – 4.9 per 1,000 patient years

DPP4i – 2.3 per 1,000 patient years

Adjusted

SGLT2i HR of 2.2 compared to DPP4i

Fralick et al. NEJM. 2017

Table S6. Baseline Characteristics of Participants With Diabetic Ketoacidosis Adverse Events

	Participants with Diabetic Ketoacidosis* (n = 12)	All Participants (n = 4401)
Background insulin treatment—no. (%)	11 (91.7)	2884 (65.5)
Background metformin treatment—no. (%)	4 (33.3)	2545 (57.8)
Duration of diabetes—yr	23.8	15.8
Glycated hemoglobin—%	8.9	8.3
Glycated hemoglobin >10%—no. (%)	3 (25.0)	450 (10.2)
eGFR—mL/min/1.73 m^2	54.0	56.2
Screening eGFR ≥30 to <45 mL/min/1.73 m^2—no. (%)	7 (58.3)	1313 (29.8)
History of diabetic ketoacidosis	2 (16.7)	4 (0.1)

*Precipitating factors (primarily recent or concurrent illness, recent reduction in insulin dose, or drugs affecting carbohydrate metabolism) were identified by the adjudication committee for 83% of cases (10 of 12 events) in the canagliflozin group and 100% (1 event) in the placebo group. With the exception of 1 case, concomitant blood glucose levels were >250 mg/dL (>13.9 mmol/L).

83% Sick when they developed DKA!

Neal et al. NEJM. 2017

Stop this medication if you have any signs of symptoms of an allergic reaction such as hives, itching, rash, throat swelling or difficulty breathing

You may notice an increase in urine output after starting this medication

Your blood pressure may decrease
- Monitor your blood pressure at home as your blood pressure may decrease after starting this medication
- Dizziness with standing is a common symptom, which generally resolves within 2 weeks, however, please contact me if you experience debilitating dizziness/lightheadedness of symptoms persist beyond 2 weeks

Observe "sick day" rules
- If you are feeling ill (fever, infection, poor appetite, nausea, vomiting, diarrhea) and are unable to maintain adequate hydration HOLD this medicine until you feel better for 24 hours.
- If you have a severe illness please go to the Emergency Room

Hold this medication for 72 hours prior to any scheduled surgery that requires you to be NPO (not eat or drink) the night before the procedure

This medication should generally be held if you are admitted to the hospital. Please confer with your inpatient doctors.

Avoid the Atkins or Keto diet

Monitor your blood glucose levels as your insulin requirements may decrease when you start this medication

Wound on your legs, feet or groin
- If you notice a wound, ulcer or skin breakdown on your legs, feet or groin, HOLD this medication and contact me or your primary care provider or go to the emergency room

Burning with urination
- If you have burning with urination HOLD this medication and contact me or your primary care doctor

Redness or itching in the groin area or foul-smelling vaginal or penile discharge
- Keep your genital area clean
- If you notice any redness or itching in the genital area or are having any vaginal or penile discharge, HOLD this medication and inform me. You may need a cream or oral medication to treat an underlying fungal infection.

Some More Practical Advice

Your job is to Flozinate!

These are NOT new medications; they have been around since 2013

The molecule initially came from apple bark – this can resonate with people!

Thank you!

CV Medications and access

Preferred WA Medicaid Combination BP Meds

*all cover lisinopril-HCTZ, metoprolol-HCTZ, triamterene-HCTZ

Amerigroup	Coordinated Care	Community Health Plan of WA	Molina	United Healthcare	DSHS
Atenolol-chlorthalidone Irbesartan-HCTZ Valsartan-HCTZ	Amlodipine-valsartan Atenolol-chlorthalidone Irbesartan-HCTZ Olmesartan-HCTZ Valsartan-HCTZ	Amlodipine-valsartan Irbesartan-HCTZ Olmesartan-HCTZ	Atenolol-chlorthalidone Irbesartan-HCTZ Olmesartan-HCTZ Valsartan-HCTZ	Irbesartan-HCTZ Lisinopril-HCTZ Olmesartan-HCTZ Valsartan-HCTZ	Atenolol-chlorthalidone Irbesartan-HCTZ olmesartan-HCTZ Valsartan-HCTZ

Examples of Non-preferred Combinations

Amerigroup	Coordinated Care	Community Health Plan of WA	Molina	United Healthcare	DSHS
Olmesartan-Amlodipine-HCTZ Copay $10, needs to use mail order	Olmesartan-Amlodipine-HCTZ Requires PA	Olmesartan-Amlodipine-HCTZ Requires PA	Olmesartan-Amlodipine-HCTZ Requires PA	Olmesartan-Amlodipine-HCTZ Requires PA	Olmesartan-Amlodipine-HCTZ Requires PA
Azilsartan-chlorthalidone not on formulary	Azilsartan-chlorthalidone not on formulary	Azilsartan-chlorthalidone not on formulary	Azilsartan-chlorthalidone not on formulary	Atenolol-chlorthalidone requires PA	Azilsartan-chlorthalidone not on formulary

WA Medicaid: SGLT-2i

	Amerigroup[1]	Coordinated Care[2]	Community Health Plan of Washington[3]	Molina[4]	United Healthcare[5]	DSHS[6]
Canagliflozin (Invokana®)	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred
Dapagliflozin (Farxiga®)	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred
Empagliflozin (Jardiance®)	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred
Ertugliflozin (Steglatro®)	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred, PA Required	Non-Preferred

WA Medicaid: SGLT-2i / Metformin Combinations

	Amerigroup[1]	Coordinated Care[2]	Community Health Plan of Washington[3]	Molina[4]	United Healthcare[5]	DSHS[6]
Canagliflozin / metformin (Invokamet®)	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred
Canagliflozin / metformin ER (Invokamet® XR)	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred
Dapagliflozin / metformin ER (Xigduo® XR)	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred
Empagliflozin / metformin (Synjardy®)	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred
Empagliflozin / metformin ER (Synjardy® XR)	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred
Ertugliflozin/metformin (Segluromet™)	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred	Non-Preferred

Finerenone (Karendia)
Molina Documentation Requirements

- Diagnosis: chronic kidney disease (CKD) associated with type 2 diabetes (T2D)
- Attest member is receiving standard of care background therapy: maximum tolerated labeled dose of an angiotensin-converting enzyme inhibitor (ACEi) or angiotensin receptor blocker, unless contraindication
- Serum potassium level is < 5.0mEq/L and eGFR (ml/min/1.73m2) is > 25 (within 30 days)
- Patient has tried and failed (3-month trial) formulary preferred SGLT2 inhibitor
- No FDA labeled contraindications within the documentation: concomitant use with strong CYP3A4 inhibitors and patients with adrenal insufficiency

https://www.molinamarketplace.com/~/media/Molina/PublicWebsite/PDF/Providers/common/pa-criteria/Kerendia-finerenone-C21829-A.pdf

Finerenone (Karendia) Amerigroup Requirements

- Diagnosis: CKD with type 2 DM
- Will NOT be covered if taking a CYP 3A4 inhibitor or has adrenal insufficiency

Walmart Formulary

	$4 (30-day supply)	$10 (90-day supply)
Glimepiride 1 mg, 2 mg, 4 mg	30 tablets	90 tablets
Glipizide 5 mg, 10 mg	60 tablets	180 tablets
Metformin 500 mg, 850 mg, 1000 mg	60 tablets	180 tablets
Metformin ER 500 mg	120 tablets	360 tablets
Metformin ER 750 mg	60 tablets	180 tablets
	$9 (30-day supply)	**$24 (90-day supply**
Glipizide ER 2.5 mg, 5 mg, 10 mg	30 tablets	90 tablets
Glyburide/Metformin 2.5/500 mg, 5/500 mg	60 tablets	180 tablets
Pioglitazone 15 mg, 30 mg, 45 mg	30 tablets	90 tablets

Walmart $4/month Combination BP Meds

- Lisinopril – HCTZ
- Losartan – HCTZ
- Valsartan - HCTZ

Patient Assistance Programs

(PAP)

- Pharmaceutical manufacturers may sponsor patient assistance programs (PAPs) that provide financial assistance or free medications
- Some can provide assistance to Part D enrollees and interface with Part D plans by operating "outside the Part D benefit”
- It does not count towards a Part D beneficiary's true-out-of-pocket cost
- Annual assessment of need and forms to be submitted

Patient Assistance Programs

- Forms must be filled out completely and EXACTLY as directed
- Some require proof of income from patient
- Medications may be shipped directly to the patient's residence (e.g. LillyCares) or to the prescriber's office
- Some have automatic refills, others require prescriber's office to initiate refill (e.g. Sanofi) so patient will need to request refills in advance

DM 340B Pharmacy

Diabetes - Injectable

	Unit Price
Levemir – 1 vial	$50
Levemir FlexTouch	$10/pen
Victoza	$10/pen
Lantus – 1 vial	$50
Lantus Solostar	$10/pen
Humalog or Novolog Pen	$10/pen
Novolin N – 1 vial	$19
Novolin R – 1 vial	$19

	30 Day	90 Day
Glimepiride 1mg, 2mg, 4mg	$4	$10
Glipizide 5mg, 10mg	$4	$10
Metformin 500mg, 1000mg	$4	$10
Metformin ER 750mg	$14	$24
Glipizide ER 2.5mg, 5mg, 10mg	$19	$48
Glyburide/Metformin 2.5/500mg, 5/500mg	$19	$42
Pioglitazone 15mg, 30mg, 45mg	$16	$26
Invokana 100mg, 300mg	$25	$61
Invokamet, All strengths	$25	$61
Januvia 25mg, 50mg, 100mg	$25	$61
Janumet, All strengths	$25	$61
Farxiga 5mg	$25	$61
Jardiance 10mg, 25mg	$25	$61
Glumetza ER 500mg	$25	$61

HTN and Cholesterol 340B

Cholesterol

	30 Day	90 Day
Fenofibrate 145mg	$19	$45
Gemfibrozil 600mg	$16	$36
Simvastatin 10mg, 20mg, 40mg, 80mg	$4	$10
Atorvastatin 10mg, 20mg, 40mg, 80mg	$12	$26

Levemir 1 pen =10 but 3 pens a month for 30 units=30 dollars
Victoza 1.8mg= 10 dollars but needs 2 pens a month = 20 dollars
Lisinopril/ HCTZ 4 dollars
Metformin 1000mg 4 dollars
Simvastatin 40mg 4 dollars
Test strips 50 = 10 dollars
Total cost:
72 dollars a month

	30 Day	90 Day
Atenolol, All strengths	$4	$10
Carvedilol, All strengths	$4	$10
Clonidine 0.1mg, 0.2mg, 0.3mg	$4	$10
Furosemide, All strengths	$4	$10
Hydralazine 10mg, 25mg, 50mg	$4	$10
Hydrochlorothiazide 12.5mg, 25mg, 50mg tablets	$4	$10
Lisinopril, All strengths	$4	$10
Lisinopril/HCTZ, All strengths	$4	$10
Losartan, All strengths	$17	$42
Metoprolol Tartrate, All Strengths	$4	$10
Ramipril, All strengths	$12	$25
Warfarin, All strengths	$4	$10
Amlodipine, All strengths	$9	$24
Bisoprolol 5mg	$26	$65
Digoxin 0.125mg, 0.25mg	$18	$42
Diltiazem 30mg, 60mg, 120mg tablets	$21	$55
Diltiazem ER 120mg capsules	$14	$34
Doxazosin, All strengths	$14	$34

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REVIEW

Prescribing SGLT2 Inhibitors in Patients With CKD: Expanding Indications and Practical Considerations

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SGLT2 inhibitors have emerged as a key disease-modifying therapy to prevent the progression of chronic kidney disease (CKD). These agents prevent decline in kidney function through reduction in glomerular hypertension mediated through tubuloglomerular feedback independent of their effect on glycemic control. The proliferation of clinical trials on SGLT2 inhibitors has rapidly expanded the approved clinical indications for these agents beyond patients with diabetes mellitus (DM). We review the current indications for SGLT2 inhibitors in patients with and without diabetic kidney disease, including new evidence for use in patients with heart failure with or without reduced ejection fraction, stage 4 CKD, and chronic glomerulonephritis. The EMPA-KIDNEY trial was recently stopped early for efficacy suggesting that SGLT2 inhibitors may soon be indicated for patients with CKD without albuminuria. We review practical considerations for prescription of SGLT2 inhibitors, including the anticipated acute decline in estimated glomerular filtration rate (eGFR) on initiation, initiating the lowest dosage used in clinical trials, volume status considerations, and adverse event mitigation. Combination therapy in patients with DM may be considered with agents, including glucagon-like peptide-1 receptor agonists (GLP-1-RAs), novel mineralocorticoid receptor antagonists, and selective endothelin receptor antagonists to reduce residual albuminuria and cardiovascular risk.

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In 2008, the US Food and Drug Administration mandated that new glucose-lowering therapies undergo cardiovascular outcome trials (CVOTs).[1] This led to the approval of SGLT2 inhibitors, of which 4—canagliflozin, dapagliflozin, empagliflozin, and ertugliflozin—are available in North America, whereas sotagliflozin, a dual SGLT1 and SGLT2 inhibitor, is approved in Europe, and other specific agents are available in Japan.

SGLT2 inhibitors have revolutionized the treatment of patients with type 2 DM (T2DM) with established or at risk for atherosclerotic cardiovascular disease (ASCVD) and patients with diabetic kidney disease.[2–5] The beneficial effects from SGLT2 inhibitors are apparent shortly after drug initiation suggesting mechanisms independent of glycemic control.[6] On the basis of emerging evidence, SGLT2 inhibitors are now transforming the management of heart failure and CKD in patients with and without T2DM.[7–9] Despite these proven clinical benefits, the mechanisms of benefit from SGLT2 inhibitors have not been fully elucidated. Nephrologists now play a key role in prescribing SGLT2 inhibitors as nephroprotective agents in our effort to reduce the global burden of kidney disease. We will provide an overview of SGLT2 inhibitors, their current indications and practical considerations in prescribing these agents.

Systemic Effects and Mechanisms of Action

SGLT2 inhibitors have been found to reduce hemoglobin A1c (HbA1c) by 0.6% to 1% in patients with T2DM and preserved renal function.[10,11] This effect is primarily mediated by glucosuria resulting from blockade of the SGLT2 channel predominantly localized to the S1 segment of the proximal convoluted tubule, which is responsible for >90% absorption of

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filtered glucose.[12] The resulting glucosuria can exceed 100 g/d in individuals with T2DM and 50 to 60 g/d in nondiabetics. The glucose-lowering effect of SGLT2 inhibitors is attenuated in patients with eGFR <60 ml/min per 1.73 m^2 and minimal when eGFR is <30 ml/min per 1.73 m^2.[13] Caloric loss from glucosuria typically results in 1 to 3 kg weight loss,[14] most of which is fat,[15,16] and greater weight loss is observed in patients with higher baseline HbA1c.[17]

Mechanisms of Action for End-Organ Protection

SGLT2 inhibitors are associated with a sustained modest reduction in systolic blood pressure (BP) of approximately 3 to 6 mm Hg and diastolic BP of approximately 1 to 2 mm Hg.[18,19] BP lowering is mediated through natriuresis and associated plasma volume contraction,[20] reduction in arterial stiffness,[21] and improvement in endothelial function.[22] Reduction in BP is generally observed irrespective of hypertension status[23] and is also achieved in patients with lower eGFR level.[24]

In patients with diabetes, decreased sodium delivery to the macula densa results in increased proximal tubular sodium reabsorption and afferent arteriolar vasodilatation by tubuloglomerular feedback leading to glomerular hypertension and hyperfiltration.[25] The primary mechanism by which SGLT2 inhibitors are thought to be nephroprotective is through increasing distal sodium delivery and inhibiting tubuloglomerular feedback resulting in afferent vasoconstriction and reduction in intraglomerular pressure.[26,27] A marker of this reduction in intraglomerular pressure is the reduction in albuminuria, which is largely independent of concomitant changes in metabolic parameters or eGFR.[28]

Other putative mechanisms through which SGLT2 inhibitors may be beneficial include reduction in inflammatory mediators, including interleukin-6, nuclear factor-kB, and profibrotic factors, such as transforming growth factor-ß.[24,29] In addition, by conserving energy required to reabsorb the filtered load of glucose and associated sodium, SGLT2 inhibition may attenuate renal hypoxia and is simultaneously associated with a rise in hematocrit level.[24,30,31]

SGLT2 Inhibitors and Potassium

Hyperkalemia is a frequent clinical challenge in the care of patients with CKD and may prohibit uptitration of renin-angiotensin-aldosterone system (RAAS) inhibitor blockade. SGLT2 inhibitors may enhance kaliuresis by increasing distal delivery of sodium and stimulating aldosterone.[25] In CREDENCE, which included patients with T2DM and CKD on RAAS blockade, canagliflozin reduced the incidence of hyperkalemia (K $\geq$ 6.0) by 23% without causing hypokalemia (<3.5 mmol/l) and the need for new potassium binder usage in those treated with canagliflozin by 22%.[32]

Dual SGLT1 and SGLT2 Inhibitors

Sotagliflozin is the first dual SGLT1 and SGLT2 inhibitor and is approved in Europe for both type 1 DM and T2DM. It has been postulated that SGLT1 inhibition delays intestinal glucose absorption and reduces postprandial glucose levels.[33–35] Furthermore, SGLT1 contributes to distal proximal tubular glucose reabsorption following SGLT2 inhibition when tubular glucose concentrations are increased, which may result in additional glucosuric effects in patients with more advanced CKD.[36] In the SCORED trial, 10,584 patients with T2DM, eGFR 25 to 60 ml/min per 1.73 m^2 with or without albuminuria were enrolled. However, this trial ended early at 16 months because of loss of funding. The primary end point (cardiovascular death, heart failure hospitalizations, and urgent heart failure visits) was reduced by 26% with sotagliflozin despite the relatively short trial duration (hazard ratio [HR] 0.74, 95% CI 0.63–0.88).[37] In the SOLOIST-WHF trial, initiation of sotagliflozin before or shortly following discharge reduced cardiovascular hospitalization or death and urgent heart failure visits.[35] SGLT1 inhibition may result in increased rates of diarrhea, and the additional benefit of SGLT1 blockade to SGLT2 inhibition is not yet fully understood, although sotagliflozin does reduce hyperglycemia even in patients with CKD stage 4.[38]

Current Indications for SGLT2 Inhibitors

Indications for SGLT2 inhibitors have expanded based on growing evidence from randomized controlled trials and fall broadly into the following 5 categories: glycemic control/metabolic risk, reduction in ASCVD, heart failure, diabetic kidney disease with albuminuria, nondiabetic CKD with albuminuria (Table 1).

Kidney Outcomes From CVOTs

CVOTs including EMPA-REG OUTCOME, CANVAS, DECLARE-TIMI-58, VERTIS CV, and SCORED revealed the benefit of SGLT2 inhibitors in improving cardiovascular outcomes in patients with T2DM with varying risks for ASCVD.[2–5,37] On the basis of the results of CVOTs, the Kidney Disease: Improving Global Outcomes 2020 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease now supports SGLT2 inhibitors or metformin as first-line treatment for T2DM for glycemic control.[39,40]

Secondary analysis of renal outcomes from CVOTs was the first to suggest potential benefit in patients with kidney disease. In EMPA-REG OUTCOME which included 7020 patients with T2DM with established

Table 1. Current indications for SGLT2 inhibitors

Indication	Criteria	Kidney function
Congestive heart failure	• NYHA classes II–IV • Elevated NT-proBNP • All ejection fractions	• eGFR >20 ml/min per 1.73 m^2
Glycemic control or metabolic risk	• Type 2 diabetes mellitus • First-line for glycemic control (along with metformin)	• eGFR ≥60 ml/min per 1.73 m^2 • Anticipated HbA1c ↓: 0.6%–0.9% • Anticipated weight ↓: 2–3 kg
		• eGFR 45–59 ml/min per 1.73 m^2 • Anticipated HbA1c ↓: 0.3%–0.5% • Anticipated weight ↓: 1–2 kg
		• eGFR < 45 ml/min per 1.73 m^2 • Anticipated HbA1c ↓: minimal • Anticipated weight ↓: 1–2 kg
Reduction in ASCVD	• Type 2 diabetes mellitus • Established ASCVD or high risk for ASCVD[a]	• eGFR ≥ 30 ml/min per 1.73 m^2
Diabetic kidney disease	• Type 2 diabetes mellitus	• eGFR ≥25 ml/min per 1.73 m^2 • UACR 200–5000 mg/g[b]
Nondiabetic kidney disease	• Etiology of kidney disease: ischemic ne phropathy, IgA nephropathy, FSGS, chronic pyelonephritis, chronic interstitial nephritis • No immunosuppression in prior 6 mo	• eGFR ≥ 25 ml/min per 1.73 m^2 • UACR 200–5000 mg/g[b]

ASCVD, atherosclerotic cardiovascular disease; CKD-EPI, Chronic Kidney Disease Epidemiology Collaboration; eGFR, estimated glomerular filtration rate (CKD-EPI); FSGS, focal segmental glomerulosclerosis; HbA1c, hemoglobin A1c; LDL, low-density lipoprotein; NT-proBNP, N-terminal pro-brain natriuretic peptide; NYHA, New York Heart Association; UACR, urine microalbumin-to-creatinine ratio.
[a]Atherosclerotic cardiovascular disease is defined as ischemic heart disease, ischemic cerebrovascular disease, or peripheral artery disease. High risk for atherosclerotic cardiovascular disease is defined as age ≥55 years in men and ≥60 years in women and one or more of the following risk factors: hypertension, dyslipidemia (LDL >130 mg/dl or use of lipid-lowering therapies), or tobacco use.
[b]The EMPA-KIDNEY trial was stopped early for efficacy and included patients with diabetic kidney disease and nondiabetic kidney disease with eGFR 20 to 45 ml/min per 1.73 m^2 regardless of UACR or eGFR 45 to 90 ml/min per 1.73 m^2 with UACR ≥200 mg/g; however, results have not yet been presented or published.

ASCVD and enrolled patients with eGFR ≥30 ml/min per 1.73 m^2, the renal composite outcome of end-stage kidney disease (ESKD) and doubling of serum creatinine was lower with empagliflozin (HR 0.54, 95% CI 0.40–0.75), with a reduction in ESKD (HR 0.45, 95% CI 0.21–0.97) and doubling in serum creatinine (HR 0.56, 95% CI 0.39–0.79).[4] As a consequence of the reduction in intraglomerular hypertension and other protective pathways discussed previously, albuminuria decreases by 30% to 50% regardless of baseline albuminuria within the span of weeks in response to SGLT2 inhibition. For example, in EMPA-REG OUTCOME, patients taking empagliflozin had a reduction in albuminuria of 7% in those with normoalbuminuria, 25% with microalbuminuria, and 32% with macroalbuminuria, which was sustained when measured at follow-up at 164 weeks.[28] On stopping these agents, albuminuria increases within weeks suggesting a contribution from underlying hemodynamic mechanisms.

In the CANVAS Program, which enrolled patients with T2DM with high cardiovascular risk and eGFR >30 ml/min per 1.73 m^2, the renal composite outcome was also lower with canagliflozin (HR 0.53, 95% CI 0.33–0.84).[3] DECLARE-TIMI 58, which only included patients with T2DM with established or multiple risk factors for ASCVD and eGFR >60 ml/min per 1.73 m^2, similarly favored SGLT2 inhibitor use, which reduced the composite renal outcome of sustained eGFR decline of ≥40%, ESKD, or renal death (HR 0.53, 95% CI 0.43–0.66).[2] Despite the positive outcomes, CVOTs were not powered for kidney-related outcomes and patients with CKD comprised <30% of the study cohorts but informed subsequent dedicated trials for patients with kidney disease.[41] In VERTIS CV, ertugliflozin was associated with preservation of eGFR decline by >0.75 ml/min per 1.73 m^2 per year with greater benefit in reducing heart failure hospitalizations in those with more advanced CKD.[5,42–44] In SCORED, which included patients with CKD with eGFR 25 to 60 ml/min per 1.73 m^2, a secondary kidney end point was not significantly different between sotagliflozin and placebo (HR 0.71, 95% CI 0.46–1.08), although the trial was terminated early and likely not of a sufficient duration to detect these differences in composite end points.[37]

CKD Trials

CREDENCE and DAPA-CKD are seminal randomized controlled trials which specifically evaluated the effect of SGLT2 inhibitors on a primary kidney end point and ultimately provide the strongest evidence for use in patients with CKD (Table 2). CREDENCE included 4401 patients aged ≥30 years with T2DM with albuminuria (microalbumin-to-creatinine ratio [ACR] 300–5000 mg/g), eGFR 30 to 90 ml/min per 1.73 m^2, HbA1c 6.5% to 12%, on maximal tolerated RAAS blockade. The trial was stopped early after a median follow-up of 2.62 years because of benefit found in the interim analysis.

The primary composite of doubling of creatinine, ESKD, and death from renal or cardiovascular causes was reduced by 30% with canagliflozin. Benefit was consistent across renal end points with lower risk of doubling serum creatinine (HR 0.60, 95% CI 0.48–0.76) and ESKD (HR 0.68, 95% CI 0.54–0.86). Decline in eGFR was lower in the canagliflozin group (−3.19 ml/min per 1.73 m^2 per year) in comparison to −4.71 ml/min per 1.73 m^2 per year in the placebo group. This finding was observed despite only modest changes in blood glucose, weight, and BP. Extrapolating between-group differences in eGFR loss to the average 63-year-old patient from CREDENCE with an eGFR of 56 ml/min per 1.73 m^2 would result in a delay in progression to ESKD by as much as 15 years.[45]

DAPA-CKD enrolled 4304 adults with both diabetic and nondiabetic kidney diseases with eGFR 25 to 75 ml/min per 1.73 m^2, ACR 200 to 5000 mg/g on maximal tolerated RAAS blockade and followed participants for a median of 2.4 years.[8] Dapagliflozin reduced the primary composite outcome of sustained decline in the estimated GFR by >50%, ESKD, and renal or cardiovascular death by 39% with a number need to treat of 19. Importantly, the effects of dapagliflozin were similar in patients with T2DM (HR 0.64, 95% CI 0.52–0.79) or without T2DM (HR 0.50, 95% CI 0.35–0.72). All individual components of the renal end point had benefit with the risk of ESKD reduced by 36% and 50% eGFR decline reduced by 47%. The risk for hospitalization for heart failure or cardiovascular was reduced by 29% similar to previous CVOTs. The participants had a mean baseline eGFR of 43 ml/min per 1.73 m^2, and the slope of eGFR decline from baseline to 30 months was −2.86 ml/min per 1.73 m^2 for dapagliflozin and −3.79 ml/min per 1.73 m^2 per year for placebo, resulting in a between-group difference of 0.93 ml/min per 1.73 m^2 per year (95% CI 0.61–1.25). Both CREDENCE and DAPA-CKD represent a strong win for the field of nephrology, collectively revealing impressive benefit of SGLT2 inhibitors on hard renal end points in patients with CKD with albuminuria regardless of diabetes status.

From a safety perspective, similar to CVOTs, a higher incidence of genital mycotic infection (GMI) noted was also observed, although reassuringly, no increase in serious volume depletion, hypotension, or hypoglycemia was observed in CREDENCE or DAPA-CKD.[8,46] In CREDENCE, the incidence of diabetic ketoacidosis (DKA) was higher with canagliflozin treatment, although absolute rates were low (2.2 vs. 0.2 per 1000 patient-years). In DAPA-CKD, no cases of DKA were reported with dapagliflozin treatment; however, all patients should receive counseling regarding "sick day" medication management upon SGLT2 inhibitor prescription.

SGLT2 Inhibitors in Heart Failure

Subsequent to the consistent benefits in heart failure hospitalization risk reported in CVOTs,[2–4] in patients with established heart failure with reduced left ventricular ejection fraction (≤40%), a reduction in the composite of heart failure hospitalizations or cardiovascular death was observed in both DAPA-HF and EMPEROR-Reduced, independent of diabetes status.[7,47] The DAPA-HF trial compared dapagliflozin with placebo in adults with heart failure with left ventricular ejection fraction ≤40%, elevated N-terminal pro-brain natriuretic peptide, and eGFR ≥30 ml/min per 1.73 m^2 on a background standard of care. The primary composite outcome of cardiovascular death, heart failure hospitalization, or urgent heart failure visit was reduced by 26%. In EMPEROR-Reduced, which included adults with chronic heart failure left ventricular ejection fraction ≤40%, New York Heart Association II to IV, elevated N-terminal pro-brain natriuretic peptide, on appropriate heart failure therapy with eGFR >20 ml/min per 1.73 m^2, dapagliflozin reduced the primary composite outcome by 25%. The composite kidney outcome (≥50% sustained decline in eGFR, ESKD, and renal death) was reduced with dapagliflozin (HR 0.71, 95% CI 0.44–1.16). Annual change in eGFR was −3.10 ml/min per 1.73 m^2 in the placebo group versus −2.05 ml/min per 1.73 m^2 per year in the dapagliflozin group (95% CI −2.36 to −1.75) with no difference by diabetes status.

Historically, therapies have been lacking in patients with heart failure with preserved ejection fraction (>40%). However, in the EMPEROR-Preserved trial, which enrolled patients with left ventricular ejection fraction >40% and included patients with eGFR >20 ml/min per 1.73 m^2, empagliflozin reduced the combined risk of cardiovascular death or hospitalization for heart failure (HR 0.79, 95% CI 0.69–0.90) regardless of the presence or absence of diabetes.[9] In EMPEROR-Preserved, 50% of participants had eGFR <60 ml/min per 1.73 m^2 and had similar benefit for the primary outcome (HR 0.78, 95% CI 0.66–0.91). Similarly, consistent benefit on heart failure end points was observed in subgroup analysis of patients with eGFR <60 ml/min per 1.73 m^2 in DAPA-HF and EMPEROR-Reduced.[48] Together, these trials provide the evidence to safely support SGLT2 inhibitor use in all patients with heart failure irrespective of ejection fraction, down to an eGFR of 20 ml/min per 1.73 m^2. The recently completed EMPULSE trial revealed clinical benefit with in-hospital empagliflozin treatment among patients admitted with acute heart failure regardless of left ventricular ejection fraction. In this trial, empagliflozin was well tolerated with renal failure occurring

in 7.7% in those receiving empagliflozin in comparison to 12.1% with placebo.[49]

Real-World Effectiveness Studies

Real-world effectiveness studies have confirmed that the benefits of SGLT2 inhibitors extend to routine clinical practice. CVD-REAL 3, a multinational observational cohort study, assessed kidney outcomes in 35,561 patients initiating SGLT2 inhibitors propensity matched to other glucose-lowering agents and found that SGLT2 inhibitors reduced eGFR decline by 1.53 ml/min per 1.73 m^2 per year (95% CI 1.34–1.72). Similar to randomized controlled trials, the composite outcome of 50% decline in eGFR or progression to ESKD was lower with SGLT2 inhibitors.[50–52] From a safety perspective, similar to results of clinical trials,[53] in real-world evidence studies, SGLT2 inhibitors reduce the risk of acute kidney injury compared with other glucose-lowering agents,[54] potentially as a result of improved kidney oxygenation and kidney perfusion.[55]

Stage 4 CKD

The most robust evidence for use of SGLT2 inhibitors in stage 4 CKD is a prespecified analysis of DAPA-CKD in 624 of 4304 patients (14%) with baseline eGFR 25 to 30 ml/min per 1.73 m^2. Consistent with results from the overall trial, a 27% reduction in the primary composite end point (50% sustained decline in eGFR, ESKD, or kidney/cardiovascular death) was observed. Dapagliflozin resulted in a 28% reduction in the risk for ESKD, with an eGFR slope decline of 2.15 ml/min per 1.73 m^2 in the dapagliflozin group in comparison to 3.38 ml/min per 1.73 m^2 in the placebo group with separation of the eGFR curves evident by 16 months. No difference in adverse events, including renal related or volume depletion, was noted. Furthermore, no significant heterogeneity by diabetes status or albuminuria was observed. Although evidence for kidney-related end points remains limited for patients with eGFR <25 ml/min per 1.73 m^2, it should be emphasized that SGLT2 inhibitors may be continued until patients are on dialysis.

Patients With CKD Without Albuminuria

Meta-analysis of CVOTs has revealed that the benefits of SGLT2 inhibitors on delaying CKD progression are consistent regardless of baseline albuminuria.[2–4,46,56] To definitively determine benefits in patients with low eGFR and low urine ACR (UACR), the EMPA-KIDNEY trial included adults with or without diabetes with eGFR 20 to 45 regardless of albuminuria or eGFR 45 to 90 ml/min per 1.73 m^2 with UACR $\geq$ 200 mg/g on maximally tolerated RAAS blockade.[57] This study enrolled 6609 patients with a mean eGFR of 37.5 ml/min per 1.73 m^2. Notably, this cohort includes patients with glomerular disease ($n = 1669$) and hypertensive/renovascular disease ($n = 1444$).[58] The primary outcome of this trial was a sustained $\geq$40% decline in eGFR, ESKD, or death from renal or cardiovascular causes. The EMPA-KIDNEY trial was stopped early in March 2022 for efficacy suggesting that CKD patients without albuminuria also benefit from SGLT2 inhibitors and will soon markedly expand the population eligible for therapy.[59]

SGLT2 Inhibitors in Glomerulonephritis

Although patients with glomerulonephritis most often require immunosuppressive therapy, those who develop CKD secondary to chronic damage or scarring may share a common final pathway mediated by hyperfiltration, which may be amenable to SGLT2 inhibition. In the TRANSLATE study, short-term treatment with dapagliflozin did not significantly alter renal hemodynamics or reduce proteinuria in 10 patients with focal segmental glomerulosclerosis (FSGS).[60] Similarly, the DIAMOND trial first evaluated this hypothesis in patients without diabetes CKD with eGFR $>$ 25 ml/min per 1.73 m^2 and 500 to 3500 mg/d proteinuria, including patients with IgA nephropathy ($n = 25$) and FSGS ($n = 11$).[61] Dapagliflozin was associated with an acute dip in eGFR on initiation suggestive of a beneficial hemodynamic effect, but it did not result in a significant reduction in proteinuria compared with placebo in a 6-week treatment period, and the 17% reduction in UACR also did not reach significance.[61]

DAPA-CKD was the largest trial studying use of SGLT2 inhibitors in patients with chronic glomerulonephritis ($n = 695$) to date, although patients with a history of immunosuppression in the prior 6 months were excluded.[8,62] DAPA-CKD included 270 participants with IgA nephropathy, of whom 254 (94%) had pathologic confirmation by kidney biopsy. The mean eGFR of participants was 43.8 ml/min per 1.73 m^2 with a median ACR 900 mg/g, who were followed for a median of 2.1 years. In a prespecified analysis of IgA nephropathy participants, the primary composite kidney outcome was lower for patients with dapagliflozin (HR 0.29, 95% CI 0.12–0.73) with a mean annual rate of eGFR decline of 3.5 ml/min per 1.73 m^2 with dapagliflozin and 4.7 ml/min per 1.73 m^2 with placebo. Furthermore, dapagliflozin resulted in a 26% reduction in albuminuria in comparison to placebo. Interestingly, the primary outcome event rate was more than double in the placebo group (24% at 32 months), compared with what would have been predicted for the average DAPA-CKD patient using the international IgA nephropathy risk prediction tool, suggesting a high-risk group of participants. Nevertheless, the overall

findings were supportive of SGLT2 inhibitor use in IgA nephropathy.[63,64]

For FSGS, a prespecified analysis of DAPA-CKD included 115 individuals with FSGS, of which 105 (90%) were biopsy proven.[65] The primary composite kidney outcome did not reach statistical significance (HR 0.62, 95% CI 0.17–2.17). However, participants treated with dapagliflozin had 26.1% reduction in albuminuria compared with 9.9% in placebo which persisted after a year. Furthermore, the annual mean rate of eGFR decline was lower in those receiving dapagliflozin (−1.9 ml/min per 1.73 m^2, 95% CI −3.0 to −0.9) in comparison to placebo (−4.0 ml/min per 1.73 m^2, 95% CI −4.9 to −3.0).

Reduction in albuminuria has been used as a useful surrogate marker in clinical trials for FSGS, and although the primary outcome in DAPA-CKD was not significant in participants with this condition, attenuation of eGFR decline with dapagliflozin supports long-term benefit in patients with FSGS. For example, by modifying the eGFR slope, a hypothetical DAPA-CKD patient with a mean baseline eGFR of 43 ml/min per 1.73 m^2 would have an 8-year delay in reaching eGFR of 10 ml/min per 1.73 m^2. It may also be relevant that FSGS is a heterogeneous disease entity, and the exclusion of recent immunosuppression suggests that most patients with FSGS in DAPA-CKD may have had secondary etiologies. In patients with both IgA nephropathy and FSGS, SGLT2 inhibitors were well tolerated with no cases of major hypoglycemia or DKA in those receiving dapagliflozin.

In a prespecified analysis of DAPA-CKD, patients with T2DM had a 35.1% reduction in UACR in comparison to 14.8% in nondiabetics suggesting attenuated reduction in intraglomerular hypertension in nondiabetics. However, dapagliflozin had similar effects on kidney outcomes regardless of DM status suggesting kidney protective effects of SGLT2 inhibitors in nondiabetic patients may be partially mediated by mechanisms beyond inhibiting tubuloglomerular feedback, such as reduction in tubular workload, increased autophagy, and anti-inflammatory or antifibrotic effects.[66]

In both DIAMOND and DAPA-CKD,[8,61] patients were required to be on the maximal tolerated dose of RAAS blockade. Given the positive findings from DAPA-CKD in patients with chronic glomerulonephritis, in patients with IgA nephropathy and FSGS, SGLT2 inhibitors should be considered as a component of "conservative care" for those with proteinuria. However, it should be emphasized that despite the benefit of SGLT2 inhibitors in IgA nephropathy and FSGS, these therapies should not be used in lieu of immunosuppression when clinically indicated. Heightened vigilance for infectious complications should also be considered in those receiving immunosuppression given that those receiving immunosuppression were excluded from clinical trials. Patients with lupus nephritis and antineutrophil cytoplasmic antibody vasculitis have also not been studied to date because of the relapsing and remitting nature of the disease processes, but future use may consider whether there is role for SGLT2 inhibitors in those who have achieved remission and are considered to have stable or inactive disease.[67]

Adverse Effects and Mitigation

Although SGLT2 inhibitors are generally well tolerated by most patients, clinicians should take potential adverse effects into consideration when prescribing these agents. Patients should be counseled regarding potential adverse events, as the risk may be reduced when appropriate mitigation strategies are followed.

Infectious Complications

Owing to glucosuria, SGLT2 inhibitors are associated with a 2- to 4-fold increased risk for GMIs.[68–70] Furthermore, the increased risk of GMIs versus placebo was similar across all SGLT2 inhibitors.[71] A retrospective analysis found that GMIs were most common in the first months after initiating SGLT2 inhibitors and are more common in women and those with prior GMIs.[72] Strategies to reduce this risk include counseling the patient to maintain genital hygiene, including keeping the genital region dry. Prior history of GMI is not a contraindication to treatment, and prophylactic topical treatment with antifungal agents can be considered in high-risk individuals. If a patient develops an uncomplicated fungal infection, this may be easily treated with a single dose of an oral agent, such as 150 mg of fluconazole, and discontinuation of the SGLT2 inhibitor is typically not required.[73]

Fournier's gangrene is an extremely rare, life-threatening condition associated with necrotizing fasciitis of perineal soft tissue. In 2018, US Food and Drug Administration identified 55 unique cases of Fournier's gangrene in patients receiving SGLT2 inhibitors,[74] and a meta-analysis involving 84 trials and including >42,000 patients receiving SGLT2 inhibitors found no difference in the risk of Fournier's gangrene with SGLT2 inhibitor use.[75] Although earlier studies suggested that SGLT2 inhibitors were associated with possible increased risk for urinary tract infections,[10,76,77] subsequent randomized controlled trials have revealed no association.[2–4,46] However, in patients with a history of complicated or recurrent urinary tract infections including those with chronic indwelling Foley catheters, SGLT2 inhibitors should be used with caution.

Amputation

The CANVAS Program raised a concern regarding an association between canagliflozin and minor and major amputations.[3] However, CREDENCE reported similar incidences of amputation in both the canagliflozin and placebo groups.[46] A real-world meta-analysis comparing canagliflozin and other antihyperglycemic agents did not find any association with amputation, and the black box warning for amputation was removed in 2020.[78] No subsequent trials have revealed any association between other SGLT2 inhibitors and amputation risk.[79,80] In clinical practice, routine foot care is recommended in all patients with diabetes, and it is also important to identify patients who may have an indication for SGLT2 inhibition on the basis of peripheral vascular disease, to reduce ASCVD risk.

Fractures

The CANVAS Program reported a link between canagliflozin and increased risks of fractures.[3] However, in other studies involving canagliflozin, including CREDENCE, no such safety signal was detected.[46,81] Meta-analyses including canagliflozin, dapagliflozin, empagliflozin, and ertugliflozin[68,82,83] have found no significant association with fracture.[84]

Diabetic Ketoacidosis

SGLT2 inhibitors are rarely associated with euglycemic DKA resulting in a US Food and Drug Administration warning in 2015. The frequency of DKA reported in CVOTs in patients with T2DM receiving SGLT2 inhibitors was low,[2–5] but occurred in 4% to 6% of patients with type 1 DM.[85,86] Reports analyzing the US Food and Drug Administration Adverse Events Reporting System found a 7-fold higher rate of DKA with SGLT2 inhibitors in patients with T2DM when compared with dipeptidyl peptidase-4 inhibitor therapy, of which 71% had euglycemia.[87] The risk factors for SGLT2 inhibitor-associated ketoacidosis include >20% insulin dose reduction, lean body habitus, women, surgical stress, trauma, intercurrent illness, alcohol abuse, and patients with latent autoimmune diabetes of adulthood.[88] All patients being initiated on SGLT2 inhibitor must be counseled regarding risk of DKA. It is recommended that SGLT2 inhibitors be held 2 to 3 days prior to scheduled surgery. Strategies to reduce the risk of DKA include avoiding >20% reduction in insulin dose, careful monitoring following insulin dose changes, and discontinuation of SGLT2 inhibitors during episodes of acute illness, vomiting, diarrhea, or inability to eat or drink. In high-risk circumstances, monitoring of urine ketones can be considered. Following acute illness, SGLT2 inhibitors may be typically resumed 24 to 48 hours following recovery.

Practical Considerations

Accepting the Acute "Dip" in eGFR

The major mechanism by which SGLT2 inhibitors are thought to delay CKD progression is through reduction in glomerular hyperfiltration and tubuloglomerular feedback. SGLT2 inhibitors are well recognized to result in an acute transient reduction in GFR through a reduction in glomerular hypertension analogous to the mechanism of RAAS blockade. The dip in eGFR following SGLT2 inhibitor frequently elicits concern among clinicians, which may lead to inappropriate discontinuation of an effective therapy. The urge to discontinue the SGLT2 inhibitor because of a rise in serum creatinine should be resisted in most patients and efforts should be made to maintain patients on SGLT2 inhibitors given their cardiorenal benefits. In fact, a larger magnitude of dip in eGFR correlates with greater long-term benefit and therefore should be viewed as evidence of a positive hemodynamic effect.[89] Furthermore, concerns regarding the incidence of acute kidney injury with SGLT2 inhibitors have been allayed by meta-analyses from clinical trials and propensity-matched observational studies, which have found that SGLT2 inhibitors are associated with lower rates of acute kidney injury.[54,56,90]

It remains uncertain whether it is necessary to monitor serum creatinine changes shortly after SGLT2 inhibitor initiation; however, it is reasonable to monitor kidney function 1 month after initiation in higher risk patients, including those with a history of prior acute kidney injury, advanced CKD, or in those in whom there is increased concern regarding volume depletion. Traditionally, an increase in serum creatinine level by up to 30% from baseline is considered acceptable. If the level rises beyond this threshold, the patient should undergo a careful reassessment of volume status and a decision made about whether to hold the SGLT2 inhibitor temporarily and then consider rechallenging the patient once appropriate (Figure 1).

Consideration of Diuretic Effect and Volume Status

SGLT2 inhibitors result in an osmotic diuresis that seems to be additive to loop diuretics. Favorable properties in comparison to loop diuretics include a reduction in serum uric acid and that hypokalemia or hypomagnesemia is uncommon.[91,92] Although precise quantification of additional diuresis is challenging, in RECEDE-HF patients with T2DM and heart failure with reduced ejection fraction taking regular loop diuretic and empagliflozin 25 mg daily had a mean increase in 24-hour urine volume of 535 ml 3 days after SGLT2 inhibitor initiation and 545 ml by 6 weeks.[93] Correspondingly, in patients on maintenance loop diuretics, reduction in diuretic dosage should be considered with

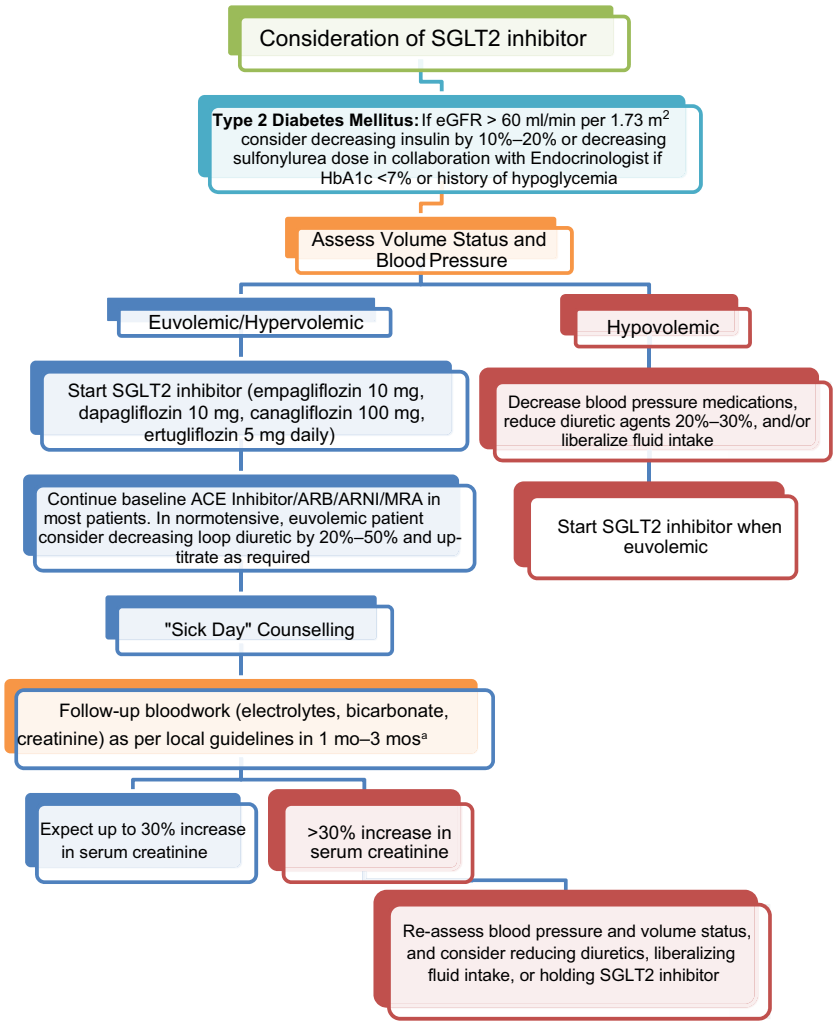

Figure 1. Proposed algorithm for SGLT2 inhibitor initiation. *Consider earlier bloodwork in higher risk: stage ≥3B CKD, prior episode(s) of acute kidney injury, or at risk for volume depletion. ACE, angiotensin-converting enzyme; ARB, angiotensin II receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; HbA1c, hemoglobin A1c; MRA, mineralocorticoid receptor antagonist.

SGLT2 inhibitor if they are not volume overloaded on clinical examination. This should also be considered in patients initiating medications with even modest diuretic effects, including mineralocorticoid receptor antagonists or angiotensin receptor-neprilysin inhibitors. Patients taking SGLT2 inhibitors may be at risk of volume depletion, during episodes of acute illness associated with nausea, vomiting, or diarrhea. Correspondingly, patients should be provided with sick day advice, whereby patients are advised to hold their SGLT2 inhibitor until resolution of symptoms. Some patients including those with heart failure may require liberalization of fluid intake if they are euvolemic when initiating SGLT2 inhibitors.

Specific Agents and Dose Considerations

In clinical trials, a dose–response relationship has not been observed for cardiorenal outcomes. Therefore, patients may be initiated on the lowest SGLT2 inhibitor dose available: canagliflozin 100 mg daily, dapagliflozin 10 mg daily, empagliflozin 10 mg daily, or ertugliflozin 5 mg daily.

Combination With GLP-1 Receptor Agonists

Although SGLT2 inhibitors offer a clear benefit in slowing progression of CKD, GLP-1-RAs also have cardiorenal benefit in patients with diabetic kidney disease. The GLP-1-RA agonists are optimal agents for patients with established ASCVD and act by increasing glucose-dependent insulin secretion, decreasing glucagon secretion, and delaying gastric emptying.[94] GLP-1-RAs are an established disease-modifying treatment for T2DM with known beneficial effects on glycemic control, weight loss, BP control, and reduction in cardiovascular events. The proposed mechanisms of benefit on kidney disease progression include natriuresis through inhibition of proximal tubular NHE3-dependent sodium reabsorption and reduction in albuminuria by decreasing renal inflammation or antioxidative effects.[95,96]

Table 2. Characteristics of participants in SGLT2 inhibitor trials that specifically recruited patients with CKD

Characteristics	CREDENCE[46]	DAPA-CKD[8]	SCORED[37]	EMPA-KIDNEY[58]
Number of participants	4401	4304	10584	6609
Mean age (yr)	63	61.8	69	63.8
Female (%)	1494 (33.9)	1425 (33.1)	4754 (44.9)	2192 (33)
UACR (mg/g) Median (IQR)	927 (463–1833)	949.3	74 (17–481)	412 (94–1190)
eGFR (ml/min per 1.73 m^2) mean (SD)	56.2 (18.2)	43.1 (12.4)	44.5	37.5 (14.8)
eGFR categories (%)				
≥45 ml/min per 1.73 m^2	3035 (69)	1782 (41.4)	5116 (48.3)	1424 (22)
≥30–44 ml/min per 1.73 m^2	1191 (27.1)	1898 (44.1)	4655 (43.9)	2905 (44)
<30 ml/min per 1.73 m^2	174 (3.9)	624 (14.5)	813 (7.8)	2280 (34)
Prior DM (%)	4401 (100)	2888 (67.1)	10,584 (100)	3039 (46)
Baseline RAAS inhibitor (%)	4395 (99)	4224 (98.1)	9365 (88.5)	5613 (84.9)
Primary kidney disease (%)				
Diabetic kidney disease	4401 (100)	2510 (58.3)	10,584 (100)	2057 (31)
Ischemic/hypertensive nephropathy		687 (16)		1445 (22)
Glomerular disease		695 (16.1)		1669 (25)
IgA nephropathy		270 (6.3)		817 (12)
Focal segmental glomerulosclerosis		115 (2.7)		195 (3.0)
Membranous nephropathy		43 (1.0)		96 (1.0)
Minimal change disease		11 (0.3)		14 (<1)
Other glomerular disease		256 (5.9)		547 (8.0)
Unknown		214 (5)		630 (10)
Other		198 (4.6)		808 (12)

CKD, chronic kidney disease; CKD-EPI, Chronic Kidney Disease Epidemiology Collaboration; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate (CKD-EPI); IQR, interquartile range; RAAS, renin-angiotensin-aldosterone inhibitor; UACR, urine microalbumin-to-creatinine ratio.

On the basis of available data, SGLT2 inhibitors are clearly favored for preventing progression of CKD (with or without cardiovascular disease) and in patients with heart failure.[39,40] In comparison, GLP-1-RAs may be preferred in patients with obesity/obesity-related complications or established ASCVD including stroke, particularly given that SGLT2 inhibitors have not been found to reduce the incidence of stroke.[97]

On the basis of complementary mechanisms of action and metabolic effects, the combination of SGLT2 inhibition plus GLP-1-RA therapy is an attractive option to enhance weight loss and reduce major adverse cardiovascular events in selected patients. Data on combination therapy have, however, been sparse. The DURATION-8 study evaluated the use of SGLT2 inhibition (dapagliflozin) and GLP-1-RA (once-weekly exenatide), which reduced HbA1c <0.4%, but found an additive BP reduction (4.2 mm Hg). An additive effect on weight loss was also observed in AWARD-10, which studied the GLP-1-RA dulaglutide versus placebo in patients already on SGLT2 inhibitors with 0.9 kg additional weight loss,[98] although SUSTAIN-9 found that semaglutide superimposed on SGLT2 inhibition resulted in 3.8 kg of additional weight loss and a reduction of HbA1c of 1.42.[99] In EXSCEL, a *post hoc* analysis which evaluated the combination of SGLT2 inhibitors and once-weekly exenatide, improvements in all-cause mortality and major adverse cardiovascular events were observed in addition to a nominal significant improvement in preventing decline in eGFR in comparison to patients not on SGLT2 inhibitors.[100] Although SGLT2 inhibitors are preferred to delay progression of CKD, patients with residual albuminuria may benefit from the addition of a GLP-1-RA to reduce this risk further. Furthermore, GLP-1-RA may be useful in low eGFR settings, where SGLT2 inhibitor or RAAS blockade titration is not possible. In clinical practice, patients with T2DM may have indications for both agents, and sequential prescription can be considered. The ongoing FLOW trial (NCT03819153) will determine whether the GLP-1-RA semaglutide delays CKD progression in T2DM patients with eGFR 50 to 75 ml/min per 1.73 m^2 and UACR 300 to 5000 mg/g or eGFR 25 to 50 ml/min per 1.73 m^2 and ACR 100 to 5000 mg/g on a background of RAAS blockade.

Combination With Mineralocorticoid Receptor Antagonists and Endothelin Receptor Antagonists

The nonsteroidal, selective mineralocorticoid receptor antagonist finerenone exhibits beneficial effects on reducing fibrosis and inflammation and was found in the FIDELIO-DKD trial to reduce albuminuria, CKD progression, and cardiovascular events in T2DM patients with eGFR 25 to 60 ml/min per 1.73 m^2 and UACR 30 to 300 mg/g or eGFR 25 to 75 ml/min per 1.73 m^2 and UACR 300 to 5000 mg/g. The FIGARO-DKD

trial further revealed similar benefit in a broader population including stages 2 to 4 CKD with moderately elevated albuminuria (30–300mg/g UACR) or stages 1 to 2 CKD with severely elevated albuminuria (300–5000 mg/g). A recent subgroup analysis of DAPA-CKD in 229 patients found similar safety and effectiveness in reducing kidney end points with combination therapy with SGLT2 inhibitors and mineralocorticoid receptor antagonists, although further studies on added benefit of combination therapy are needed.[101]

The SONAR trial evaluated the selective endothelin A receptor antagonist atrasentan in adults with T2DM with eGFR 25 to 75 ml/min per 1.73 m^2 and UACR 300 to 5000 mg/g on maximally tolerated RAAS blockade carefully selected to have 30% reduction in UACR and no clinically significant fluid retention during an enrichment period. The composite kidney end point of sustained doubling in serum creatinine, ESKD, or kidney death was reduced by 35% with atrasentan treatment.[102] However, in this study, only 1.4% of the cohort was on an SGLT2 inhibitor and the benefit conferred by combination therapy with SGLT2 inhibitors remains unclear.

Conclusion

SGLT2 inhibitors have emerged as a key therapy to prevent progression of CKD in patients with albuminuria with or without diabetes including patients with IgA nephropathy, FSGS, and heart failure. Although the indications for SGLT2 inhibitors have expanded rapidly, data remain scarce in transplant recipients or patients with ESKD and future studies should evaluate their safety and effectiveness in these populations.[103–105] Nephrology has entered an exciting era in the development of novel therapeutics for our patients. Although SGLT2 inhibitors were found to have cardiorenal benefit, there remains a large unmet need to reduce remaining risk in patients with CKD. Novel mineralocorticoid receptor antagonists and selective endothelin A receptor antagonists have been found to be effective treatments for diabetic kidney disease, and future studies will be required to evaluate benefits with combination therapy with SGLT2 inhibitors to reduce residual albuminuria and further reduce cardiovascular risk.[101,106]

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AUTHOR CONTRIBUTIONS

KY, AD, IA, and DZIC all contributed to the writing of the manuscript, provided critical edits, and reviewed and approved the final manuscript.

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Non Insurance for Mental Health Support-

They need to go into Sea Mar to speak to one of the customer service reps, bring with them a proof of income. If they are unemployed, they need to bring in documentation to how they are financially paying off their bills or if they are homeless, a letter from the homeless shelter. If they are living with someone and that person is providing financial support then they need a letter providing evidence they are supporting the individual.

They present this to Sea Mar then Sea Mar would support them in applying for financial assistance program

Washington's Access to Care standards define eligibility for its publicly-funded mental health services. To meet Access to Care standards, people must have a covered mental health condition that affects their ability to function. Many diagnoses listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM) are covered under Access to Care standards, including:

https://openpathcollective.org/

Open Path Psychotherapy Collective is a nonprofit nationwide network of mental health professionals dedicated to providing in-office and online mental health care—at a steeply reduced rate—to clients in need.

Support Groups:

NAMI Seattle
https://namiseattle.org/get-support/

An updated calendar of NAMI (and other) mental health support groups can be found on our website at http://namiseattle.org/support-groups. You may also contact our Helpline at (206) 783-9264 or helpline@namiseattle.org to request a copy. How much does it cost to attend a NAMI support group? NAMI support groups are completely free and donations are not expected. NAMI is committed to providing free services and programs to all who need them.

7 Cups of Tea
https://www.7cups.com/

It offers a supportive group of communities where individuals can share their struggles and offer support based on their own experiences. In addition to a depression support group, they offer communities for anxiety, addiction, eating disorders, and more. There are also daily check-in threads to share personal updates and check in on others.

7 Cups of Tea also offers one-on-one chat support with a volunteer listener. Listeners are trained to respond with empathy and help individuals navigate the issues they're facing.

Taking Control of your Diabetes:
https://tcoyd.org/?gclid=CjwKCAjwwL6aBhBlEiwADycBIAeqYa_INMT4waVpyo6bUJqqP0cHdJuQOpHblXYFC3ZdbDh0AmV58RoCnYQQAvD_BwE

For all people with diabetes and their loved ones to have full access to proper education and therapy to aid in the prevention, early detection and aggressive management of diabetes and its complications.

Health Unlocked:
https://healthunlocked.com/anxiety-depression-support

This community is a safe space for those affected by anxiety and depression to talk to others who truly understand. ADAA is a nonprofit dedicated to the prevention, treatment, & cure of anxiety, depression, OCD, PTSD and co-occurring disorders through education, practice, & research.

Sea Mar:
Diabetes Prevention Program

They support patients living with chronic diseases through one-on-one appointments, groups, and community-based classes. They meet with patients and their families to provide chronic disease management and support when they need it. More specifically, they offer education on diabetes, prediabetes, cholesterol, blood pressure, glucometer teaching, basic nutrition, asthma, tobacco cessation, family planning, exercise, among other topics. At each visit, the health educator spends time with the patient to set goals that help the patient achieve better health outcomes.

Cardiometabolic teleECHOTM Clinic

Patient Recommendation Form

Presentation Date: Oct 19, 2022, **Presenter name:** Carol Allrich

51 y/o with type 2 DM (diagnosed 2018), overweight (BMI 28), h/o Osteomyelitis, s/p R great toe amputation April 2022, on daily IV antibiotics, daily trips to the ER. Comorbidities include hypertension, paroxysmal AF, and depression. Chronic medical conditions c/b lack of insurance.

Case Recommendations:

In general, in our experience we have managed patients who have similar problems with the approach of:

1. Consider duloxetine(29 dollars for 2 month supply) as an aid for both neuropathic pain and depression as it may be a motivator for patient given, he did not see sig mood changes with other therapy, and this is a barrier to his current use of medications for depression. Additionally consider discussing possible counseling and support group for whole body health
2. Work with patient to try to establish insurance if able
3. Use of 340B formulary or PAP until health insurance establish
4. Reduce insulin to first ensure no low blood sugars consider glargine at 25 and 4 units of prandial insulin
5. Vs for ease and in cost is an issue consider 70/30 NovoLog mixed (NPH/NovoLog) preferred but if cost is even more of an issue could use vials of 70/30 NPH/ Novolin (relion) at Walmart formulary
6. Given possible peripheral vascular disease and AFIB he is at higher CV risk and thus goal of replacing or reducing insulin by initiation of liraglutide for CV and glycemic management
7. So, consider 25 units bid of mixed insulin + liraglutide or glargine 25 units basal and 4 units of prandial with low threshold to hold prandial insulin or reduce mixed insulin as GLP_1 Ra dose increases
8. Overtime consider addition of high intensity statin 40mg of atorvastatin
9. Recommend ASA and consider other anti-platelet agents given history of Afib and potential PAD
10. To further evaluation the Atrial fibrillation : The Zio patch and all monitors are very specific and insensitive. However if this was just atrial fibrillation in an extreme circumstance (such as post-op, shock from his severe infection), you can make a case to not anti-coagulate and follow clinically for palpitations as long as they had symptoms when they had their episode of atrial fibrillation in the hospital. However. If it was clinically silent, you need an extended monitor (implantable monitor or Apple Watch or FitBit) or you just empirically anticoagulated.

11. . Review ABI. If this ratio is less than 0.9 that is c/w with peripheral artery disease if >0.9 and < 50% stenosis in LE artery then ASA is fine. Clopidogrel would be preferred if ABI less than 0.9 and or > 50% stenosis in LE artery

Nicole Ehrhardt, MD

Physician Signature: *Nicole Ehrhardt*
Please Re-present case: dec 2022