最新腎臟病治療指引

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- 台灣腎臟醫學會 透析醫療事務委員會 執行秘書

Kidney Disease: Improving Global Outcomes

KDIGO Guidelines

1: recommend; 2: suggest
A/B: High/moderate evidence

2012 ACUTE KIDNEY INJURY (AKI)	2012 ANEMIA IN CKD	2021 ongoing AUTOSOMAL DOMINANT POLYCYSTIC KIDNEY DISEASE (ADPKD)
2021 BLOOD PRESSURE IN CKD	2012 CKD EVALUATION AND MANAGEMENT	2017 update CKD-MINERAL AND BONE DISORDER (CKD-MBD)
2020 DIABETES IN CKD	2020 (draft) GLOMERULAR DISEASES (GD)	2018 HEPATITIS C IN CKD

Executive summary of the 2020 KDIGO Diabetes Management in CKD Guideline: evidence-based advances in monitoring and treatment

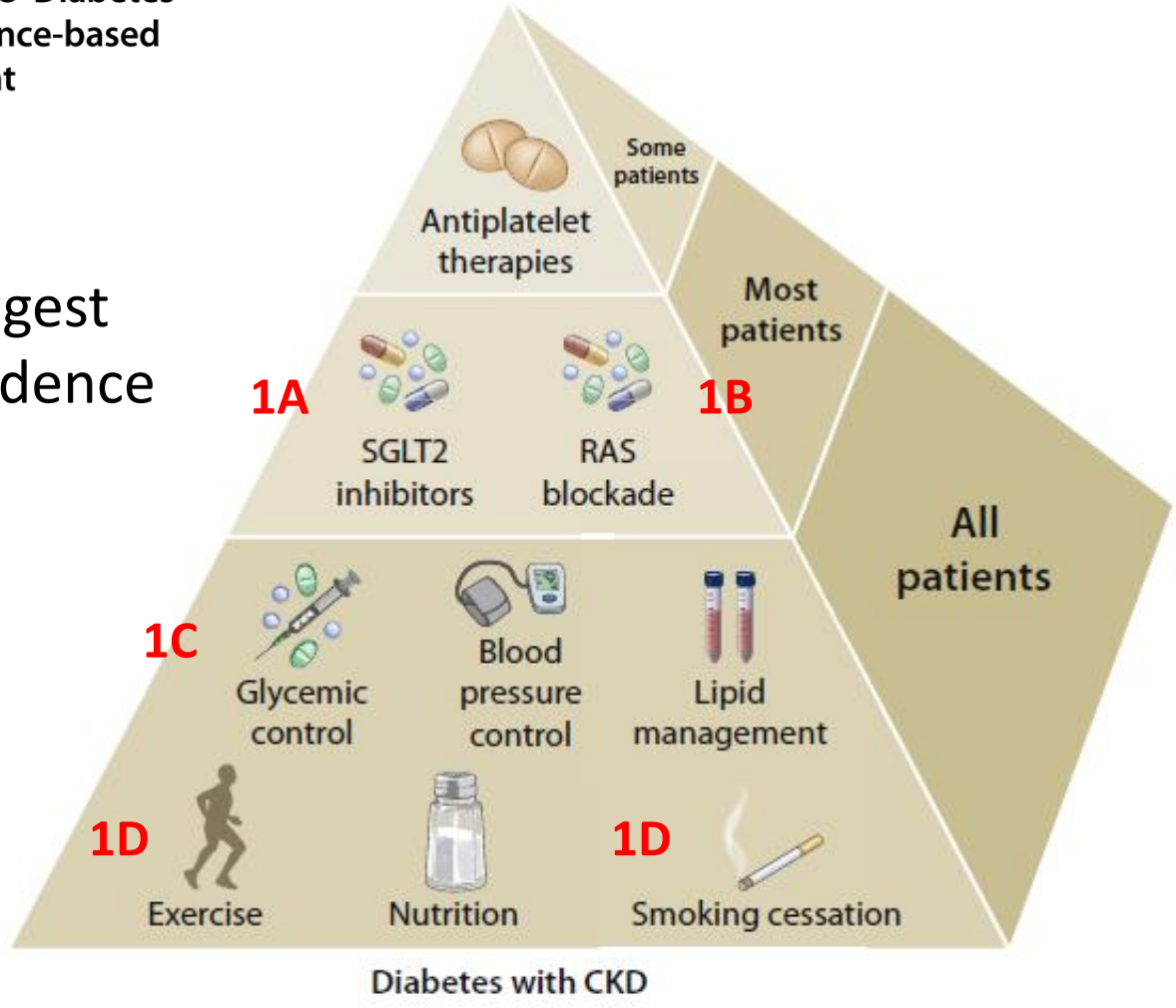
1: Recommend、2: Suggest

A, B, C, D: quality of evidence

Diabetes and CKD ☑

Diabetic kidney disease ☒

Diabetic nephropathy ☒



Executive summary of the 2020 KDIGO Diabetes Management in CKD Guideline: evidence-based advances in monitoring and treatment

- 血糖: 控制在HbA1C 6.5-8% (1C),
→ For patients with T2D, CKD, and an eGFR ≥30: metformi
→ For not achieved glycemic control or intolerant: long-act
- 血壓: RAS blockage (1B) for diabetes, hypertension, and a
- 生活型態: 戒菸 (1D)，運動(每周五次30mins以上的運動
- 營養衛教: self-management educational program (1C)

上述最推薦(recommend)~可以到達*grade 1*的等級；

- 低蛋白質飲食: < 0.8g/kg (2C)；低鈉飲食: < 2g (2C)
- Team-based, integrated care (2B)

沒有尿酸、
沒有膽固醇、
沒有低磷 !!!!

沒有不表示不重要，
但可能為次要敵人!!!

Executive summary of the 2020 KDIGO Diabetes Management in CKD Guideline: evidence-based advances in monitoring and treatment

- 血糖: 控制在HbA1C 6.5-8% (1C),

→ For patients with T2D, CKD, and an eGFR ≥30: metformin (1B), SGLT2i (1A).

→ For not achieved glycemic control or intolerant: long-acting GLP-1 RA (1B).

- 血壓: RAS blockage (1B) for diabetes, hypertension, and albuminuria
- 生活型態: 戒菸 (1D)，運動(每周五次30mins以上的運動) (1D)
- 營養衛教: self-management educational program (1C)

上述最推薦(recommend)~可以到達*grade 1*的等級；

- 低蛋白質飲食: < 0.8g/kg (2C)；低鈉飲食: < 2g (2C)
- Team-based, integrated care (2B)

• Recommendation 2.2.1	We recommend an individualized HbA1c target ranging from <6.5% to <8.0% in patients with diabetes and CKD not treated with dialysis (Figure 3) (*1C*).

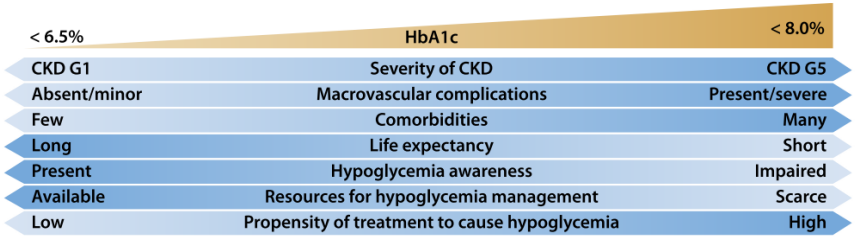


Figure 9 | Factors guiding decisions on individual HbA1c targets. CKD, chronic kidney disease; G1, estimated glomerular filtration rate (eGFR) ≥90 ml/min per 1.73 m^2; G5, eGFR <15 ml/min per 1.73 m^2; HbA1c, glycated hemoglobin.

臨床建議	證據等級	臨床建議強度	華人資料
理想的血糖控制可減少或延緩白蛋白尿的發生以及腎功能惡化。	高	強	有 [175]
血糖控制目標為糖化血色素 7% 以下。須避免低血糖事件；應根據糖尿病患個別年齡、合併症、共病情況，低血糖處理能力，訂定個別化目標。 糖化血色素在糖尿病腎臟疾病患者準確度有其侷限，糖化白蛋白較不受腎功能紅細胞壽命變化的影響可以參酌評估。 自我血糖監測、餐前餐後配對監控	中	中	有 [176]

2019 台灣糖尿病腎臟疾病臨床指引

- ✓ **Intensive sugar control** are associated with the reduced risk of microvascular and possibly macrovascular complications but also higher risk of hypoglycemia…
- ✓ Higher HbA1c target (e.g., < 7.5% or < 8%) may be selected for patients at higher risk for hypoglycemia (e.g., those with ***low GFR*** and/or ***treated with drugs associated with hypoglycemia*** such as insulin or sulfonylureas).

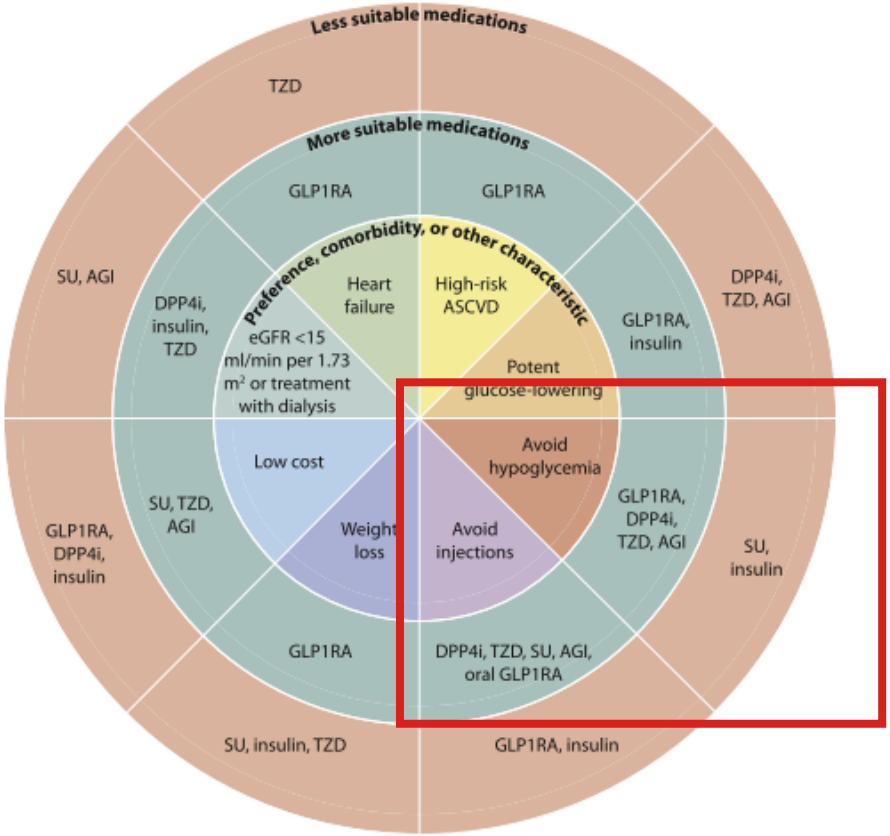
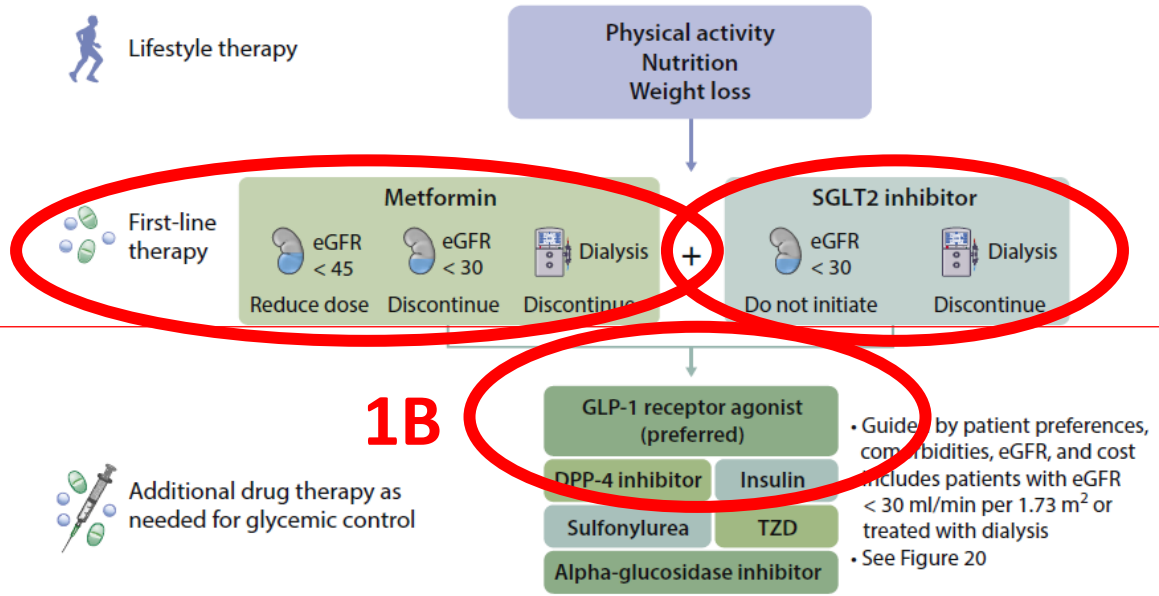


Figure 6 | Patient factors influencing the selection of glucose-lowering drugs other than sodium–glucose cotransporter-2 inhibitors and metformin in type 2 diabetes and chronic kidney disease. AGI, alpha-glucosidase inhibitor; ASCVD, atherosclerotic cardiovascular disease; DPP4i, dipeptidyl peptidase-4 inhibitor; eGFR, estimated glomerular filtration rate; GLP1RA, glucagon-like peptide-1 receptor agonist; SU, sulfonylurea; TZD, thiazolidinedione.

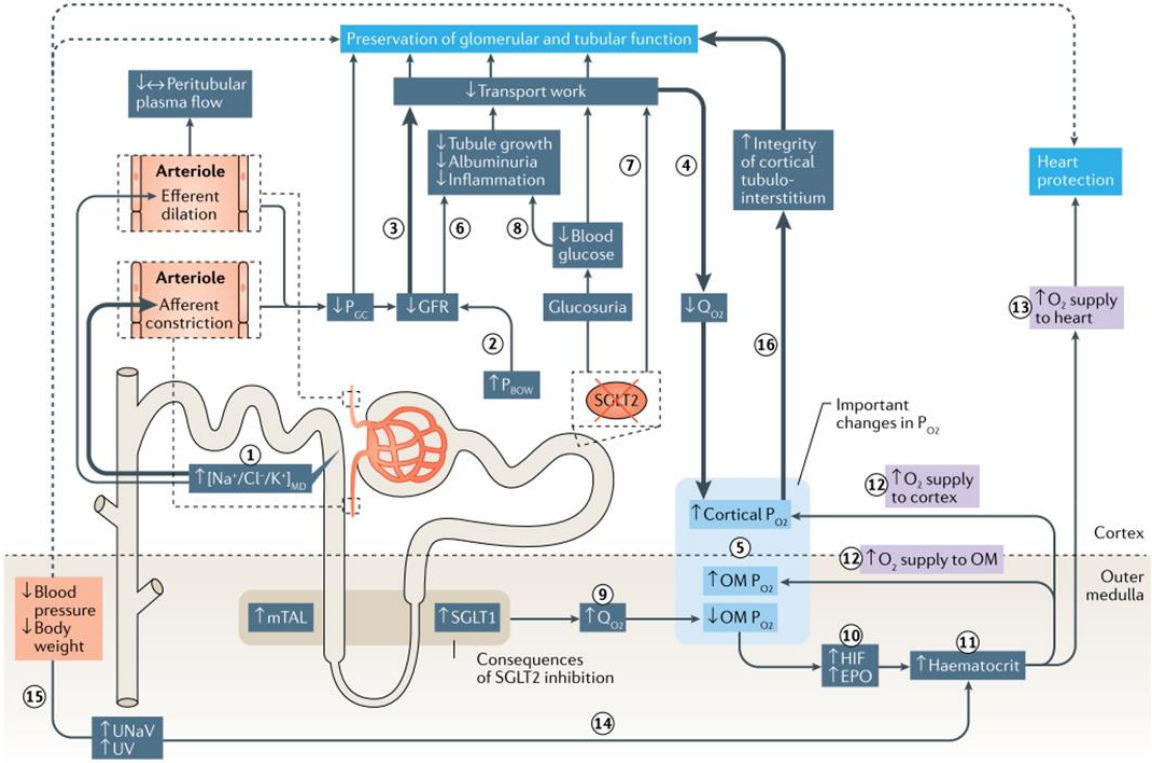
Avoid hypoglycemia:
GLP1 RA, DPP4i, TZD, AGi.

Recommendation 4.1.1: We recommend treating patients with T2D, CKD, and an eGFR ≥30 ml/min per 1.73 m^2 with metformin *(1B)*.

Recommendation 4.2.1: We recommend treating patients with T2D, CKD, and an eGFR ≥30 ml/min per 1.73 m^2 with an SGLT2i *(1A)*.



eGFR 30



Nat Rev Nephrol. 2020 Jun;16(6):317-336.

↓ *SNGFR, ↑ Natriuresis,*

1. Improve cortical oxygenation;
2. Hemodynamic benefits;
3. Not only SGLT but also NHE;

	CREDENCE	DAPA-CKD
Drug	Canagliflozin 100mg	Dapagliflozin 10mg
Participants	4401, 50% CVD	4304, 37.4% CVD
eGFR/UACR criteria	30-90/UACR 300-5000	25-75/UACR 200-5000
Mean eGFR	56	43
Follow up	2.6	2.4
Primary outcome	Composite kidney outcome	Composite kidney outcome
Results	HR 0.70 (95%CI 0.59-0.82) ESRD ↓ 32%	HR 0.61 (95%CI 0.45-0.73) ESRD ↓ 36%
CV benefits	3P MACE: HR 0.80 (95%CI 0.67-0.95)	All cause death: HR 0.69 (95%CI 0.53-0.88)

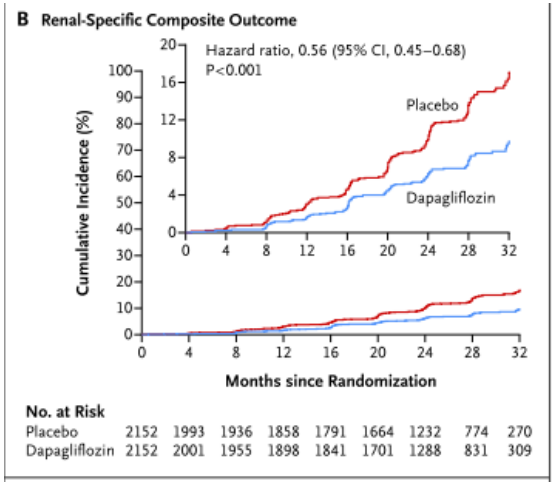
Quality of evidence of *SGLT2i* in DKD patients: *High(A) !!!*

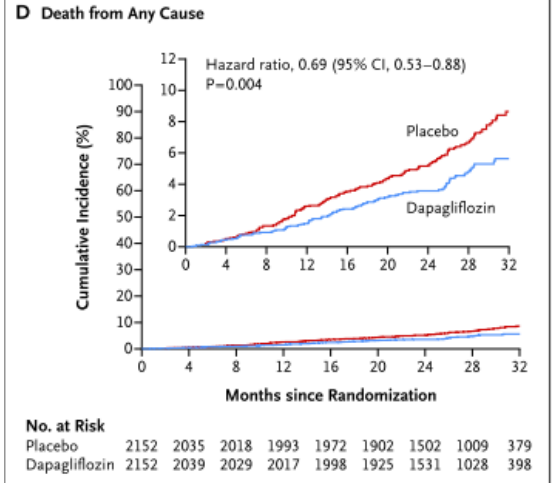
1. Risk of bias: low; 2. *Consistency*: moderate to high; 3. *Indirectness*: low; 4. *Precision*: good (narrow CI); 5. *Publication bias*: low;

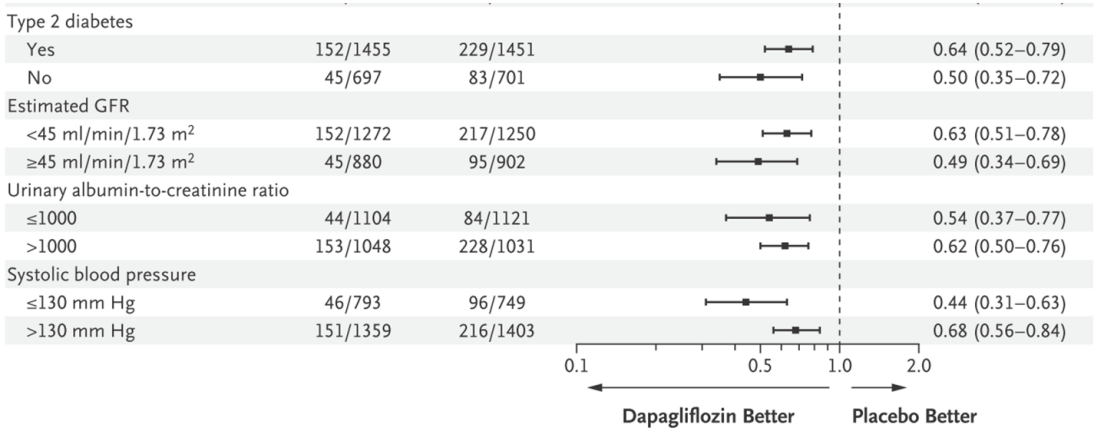
Recommendation 1.3.1: We recommend treating patients with T2D, CKD, and an eGFR ≥20 ml/min per 1.73 m^2 with an SGLT2i (1A).

2022 KDIGO guideline (draft): EMPEROR-Reduced eGFR *≥ 20.*

…*benefits and harms of SGLT2i* have been apparent across subgroups defined by eGFR…





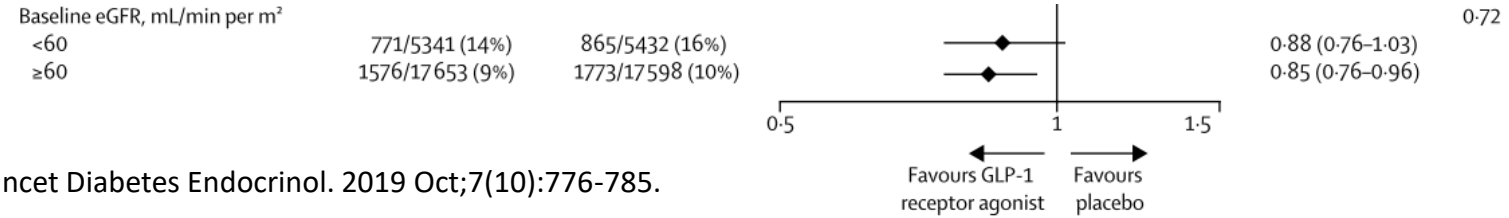


N Engl J Med. 2020 Oct 8;383(15):1436-1446.

DAPA-CKD: SGLT2 inhibitors 在CKD病患，*不論有無糖尿病*，不僅可以減少洗腎的風險，更可以減少死亡風險超過3成。更重要的是，整體副作用並未顯著增加。

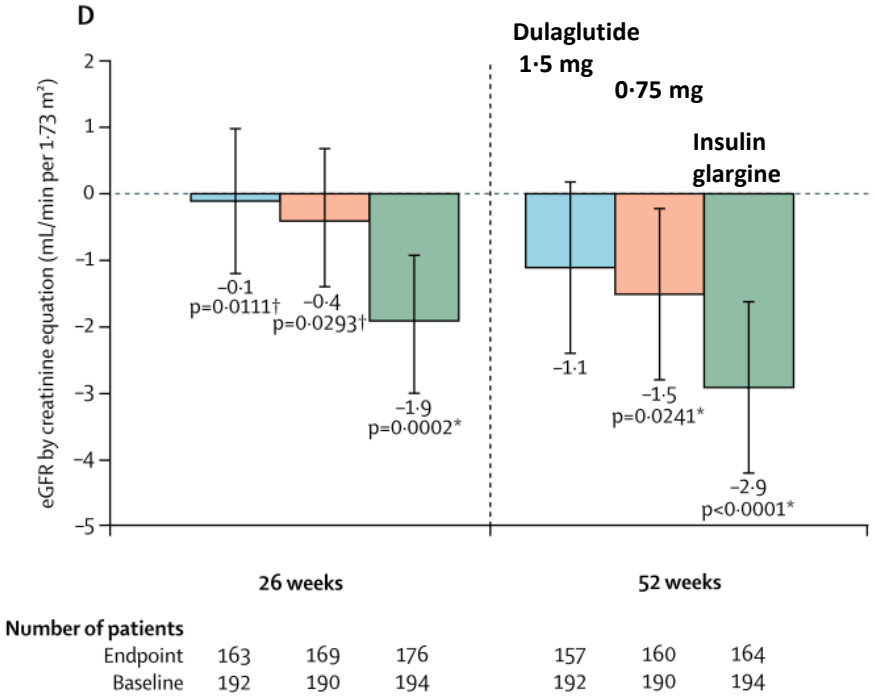
Recommendation 4.3.1: In patients with T2D and CKD who have not achieved individualized glycemic targets despite use of metformin and SGLT2i treatment, or who are unable to use those medications, we recommend a long-acting GLP-1 RA (1B).

Long acting GLP-1 RA included liraglutide (once daily), and exenatide once weekly (ow), dulaglutide and semaglutide.



Lancet Diabetes Endocrinol. 2019 Oct;7(10):776-785.

- ✓ Benefit in reduction *3P-MACE* by 12% (HR 0·88, 95% CI 0·82–0·94) and broad composite kidney outcome (*development of new-onset macroalbuminuria*, decline in estimated glomerular filtration rate [or increase in creatinine], progression to end-stage kidney disease, or death attributable to kidney causes) by 17% (0·83, 0·78–0·89).
- ✓ Consistent benefit in eGFR <60 (Trulicity: eGFR >15, others: eGFR >30).

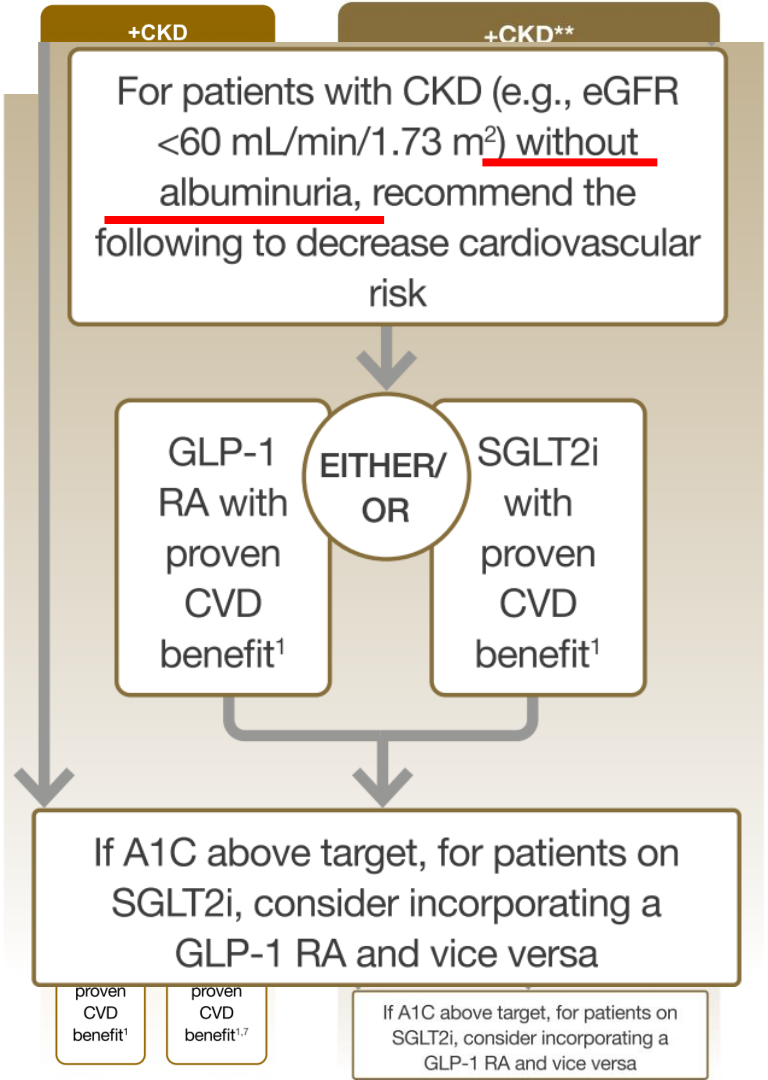


- ✓ *AWARD 7:* stage 3-4 T2D for 52 weeks, better eGFR preservation, less hypoglycemia, same sugar lowering effect as insulin. *REWIND:* in post hoc exploratory analyses, eGFR decline thresholds of 40% and 50% significantly reduced by 30% and 46%.

- ✓ FLOW trial is pending (Semaglutide AND primary kidney disease outcome trial).

ADA guideline

2021



2022

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- 營養衛教: self-management educational program (1C)

上述最推薦(recommend)~可以到達*grade 1*的等級；

- 低蛋白質飲食: < 0.8g/kg (2C)；低鈉飲食: < 2g (2C)
- Team-based, integrated care (2B)

Blood pressure in CKD 2021

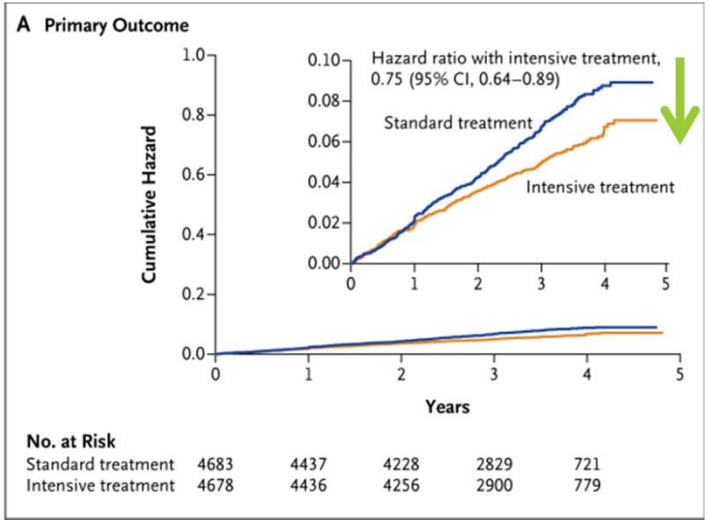
• **Recommendation 3.1.1** We suggest that adults with high BP and CKD be treated with a target systolic blood pressure (SBP) of <120 mm Hg, when tolerated, using standardized office BP measurement *(2B)*.

SPRINT
Systolic Blood Pressure Intervention Trial

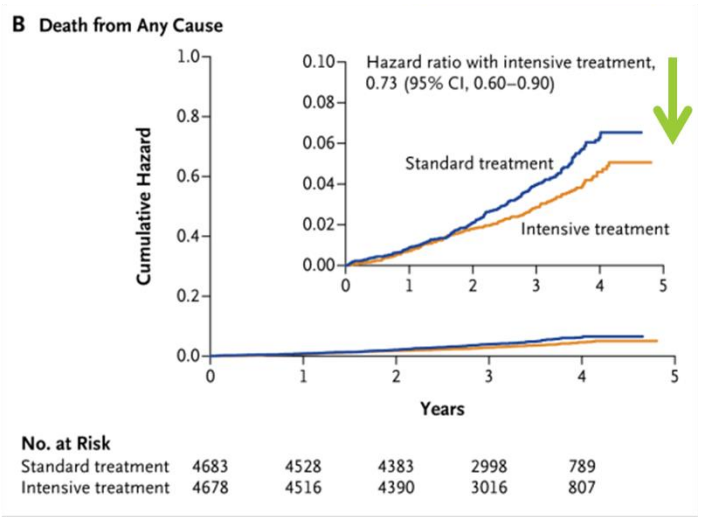
美國NIH support
9361名患者
非糖尿病患者

SBP < 140 mmHg vs
SBP < 120 mmHg

減少超過兩成
primary outcome



減少超過兩成**Death**



Major Inclusion Criteria

- At least 50 years old
- Systolic blood pressure
  - SBP: 130 – 180 mm Hg on 0 or 1 medication
  - SBP: 130 – 170 mm Hg on up to 2 medications
  - SBP: 130 – 160 mm Hg on up to 3 medications
  - SBP: 130 – 150 mm Hg on up to 4 medications
- Risk (one or more of the following)
  - Presence of clinical or subclinical CVD (not stroke)
  - Chronic Kidney Disease (CKD), defined as eGFR 20 – 59 ml/min/1.73m^2
  - Framingham Risk Score for 10-year CVD risk ≥ 15%
    - Not needed if eligible based on preexisting CVD or CKD
  - Age ≥ 75 years

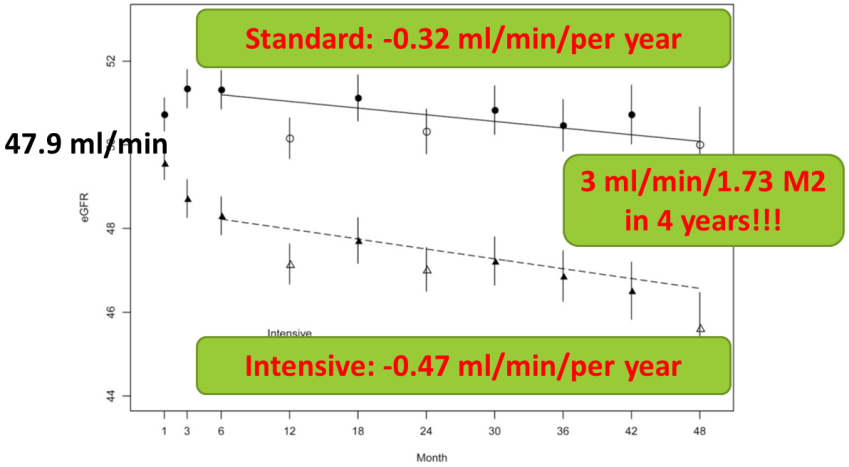
Major Exclusion Criteria

- Stroke
- Diabetes
- Congestive heart failure (symptoms or EF < 35%)
- Proteinuria >1g/d
- CKD with eGFR < 20 mL/min/1.73m^2 (MDRD)
- Risk of non-adherence

Orthostatic hypotension (one min standing SBP < 110mmHg)

應用上需要注意:

1. AOBP (automated office BP) ≠ office blood pressure (差距約16/7 mmHg);
2. 排除條件需要注意；



✓ **Intensive BP** lowering resulted in significantly *increased risk of incident CKD*, defined as eGFR decline < 30% to eGFR < 60 ml/min per 1.73 m 2 in SPRINT (absolute risk difference, 2.5%; 95% CI,1.8% to 3.2%) and to a greater degree in the ACCORD trial (糖尿病為主的研究) (absolute risk difference, 5.9%; 95% CI, 4.3% to 7.5%).

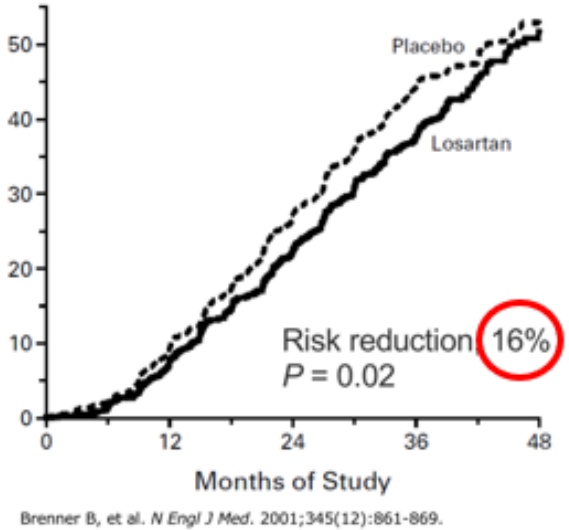
應用上需要注意: 嚴格控制血壓，有心血管疾病及存活好處；但太低的血壓確實需要擔心腎功能的惡化!!

Office blood pressure: CKD < 140/90mmHg, CKD with proteinuria < 130/80mmHg, DM < 130/80 mmHg.

2017年臺灣高血壓指引. Acta Cardiol Sin 2017;33:213

Doubling of serum creatinine, ESKD, or death

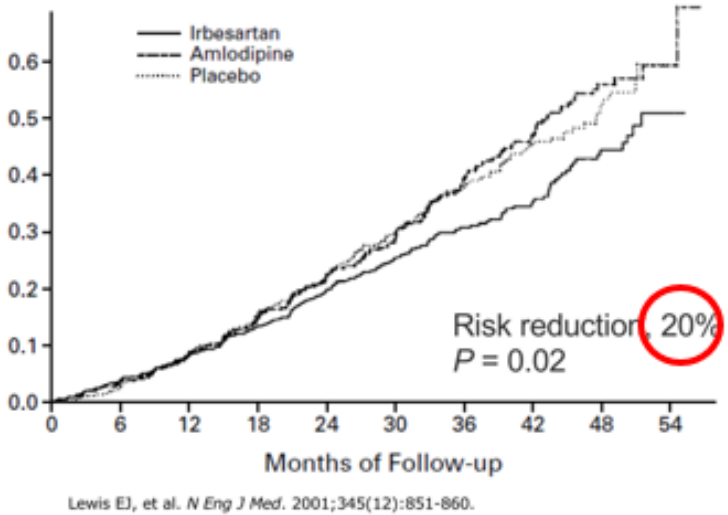
RENAAL



Brenner B, et al. *N Engl J Med*. 2001;345(12):861-869.

Cr 1.9, ACR 1200

IDNT



Lewis EJ, et al. *N Eng J Med*. 2001;345(12):851-860.

Cr 1.6, ACR 1900

使用losartan or irbesartan在DM nephropathy病患可以减少兩成多的ESKD, doubling of serum Cr…

Albuminuria category	Diabetes	No diabetes
A1 <30	PP (not graded)	PP (not graded)
A2 30-300	1B	2C
A3 >300	1B	1B

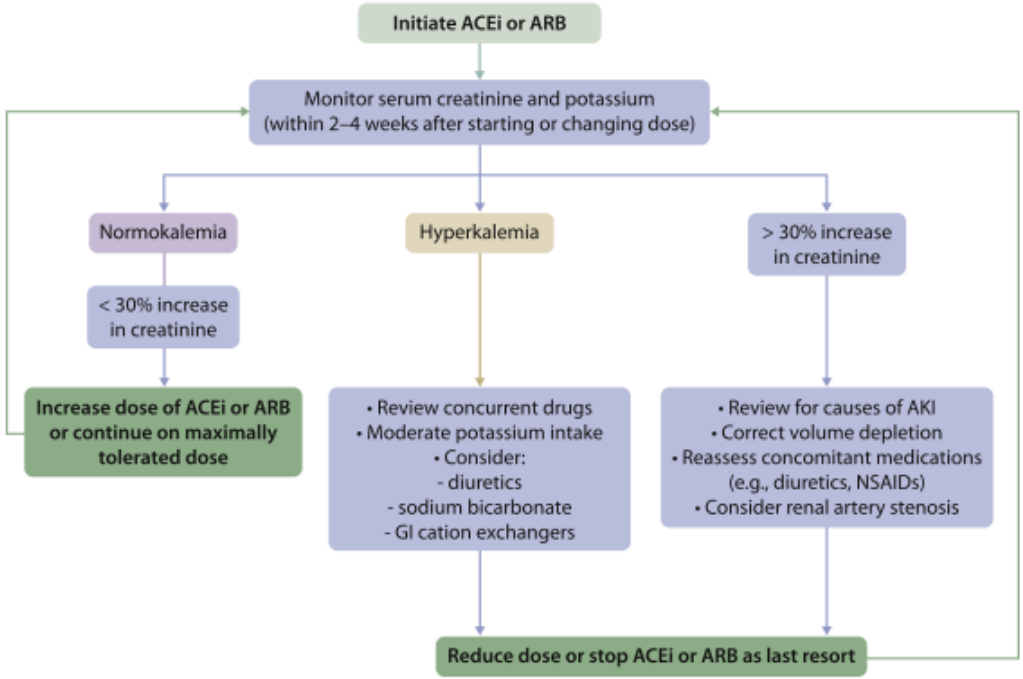


Figure 5 | Strength of recommendation for use of RASi in people with high BP and CKD according to diabetes and albuminuric status. 1B, strong recommendation based on mod

PP (practice point),

from Blood pressure in CKD 2021

59歲女性 DMN

DATE	NA	K	CL	CA	BUN	CREAT
1060203					39	1.00
1060427					22	0.97
1060719						1.20
1060825	137	4.9				1.24
1061117					44	1.34
1070201	141	4.8		9.2	40	1.22
1070424	141	4.9			45	1.51
1070523	142	5.2				1.36
1070719	141	6.0		9.3	58	1.89
1070814	140	5.1	106	9.1	45	1.69
1071009	144	5.4	109		36	1.56
1071204	142	4.3	105	9.1	26	1.45
1080220	142	4.9		9.5	35	1.43
1080515	137	4.7		9.1	30	1.73
1080611	141	4.4			33	1.54
1080826	141	4.6	106	9.3	31	1.55
1080924	142	5.4	107	9.7	44	1.75
1081022	141	5.5	107		41	1.61
1081119	141	4.5	106	9.6	37	1.52
1090114	138	5.7	102		44	1.67
1090310	141	5.2	104	9.6	42	1.87
1090407	142	5.2				1.60
1090630	139	5.6	105		56	2.14
1090729	138	5.7	106	9.4	39	1.77
1090916	140	5.6	105	9.7	38	1.90
1091118	139	5.0			43	1.77
1100129	142	4.9	106		36	1.69
1100426	138	5.6	105	9.5	39	1.58

AKI;
Valsartan
to norvasc

Cozaar 1#
Kalimate

DATE	T.PROT/Cre	Alb/Cre
1051115	0.30	
1060105		226.8
1060203		467.7
1060427		572.3
1060719		427.2
1060825		401.5
1061117	429.90	
1070201	1231.00	
1070424		714.8
1070523		965.4
1070719	476.20	
1071009	1018.00	
1071204		869.3
1080220	1700.00	
1080515	908.27	606.5
1080611	1519.72	
1080826	1591.66	
1080924	1230.50	
1081022	1628.23	1012.0
1081119		957.2
1090114	1661.87	1069.5
1090310	1385.94	
1090407		975.0
1090630	737.77	
1090916		606.3
1091118	861.99	
1100426		326.9

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→ For not achieved glycemic control or intolerant: long-acting GLP-1 RA (1B).

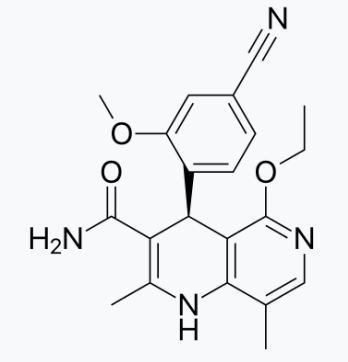
- 血壓: RAS blockage (1B) for diabetes, hypertension, and albuminuria
- Nonsteroid MRA (2A) for diabetes, eGFR ≥25, albuminuria, normal potassium. (2022)
- 生活型態: 戒菸 (1D)，運動(每周五次30mins以上的運動) (1D)
- 營養衛教: self-management educational program (1C)

上述最推薦(recommend)~可以到達*grade 1*的等級；

- 低蛋白質飲食: < 0.8g/kg (2C)；低鈉飲食: < 2g (2C)
- Team-based, integrated care (2B)

Recommendation 1.4.1: We suggest a nonsteroidal mineralocorticoid receptor antagonist with proven kidney or cardiovascular benefit for patients with T2D, an eGFR ≥25 ml/min/1.73 m^2, normal serum potassium concentration, and albuminuria despite maximum tolerated dose of RAS inhibitor. (2A)

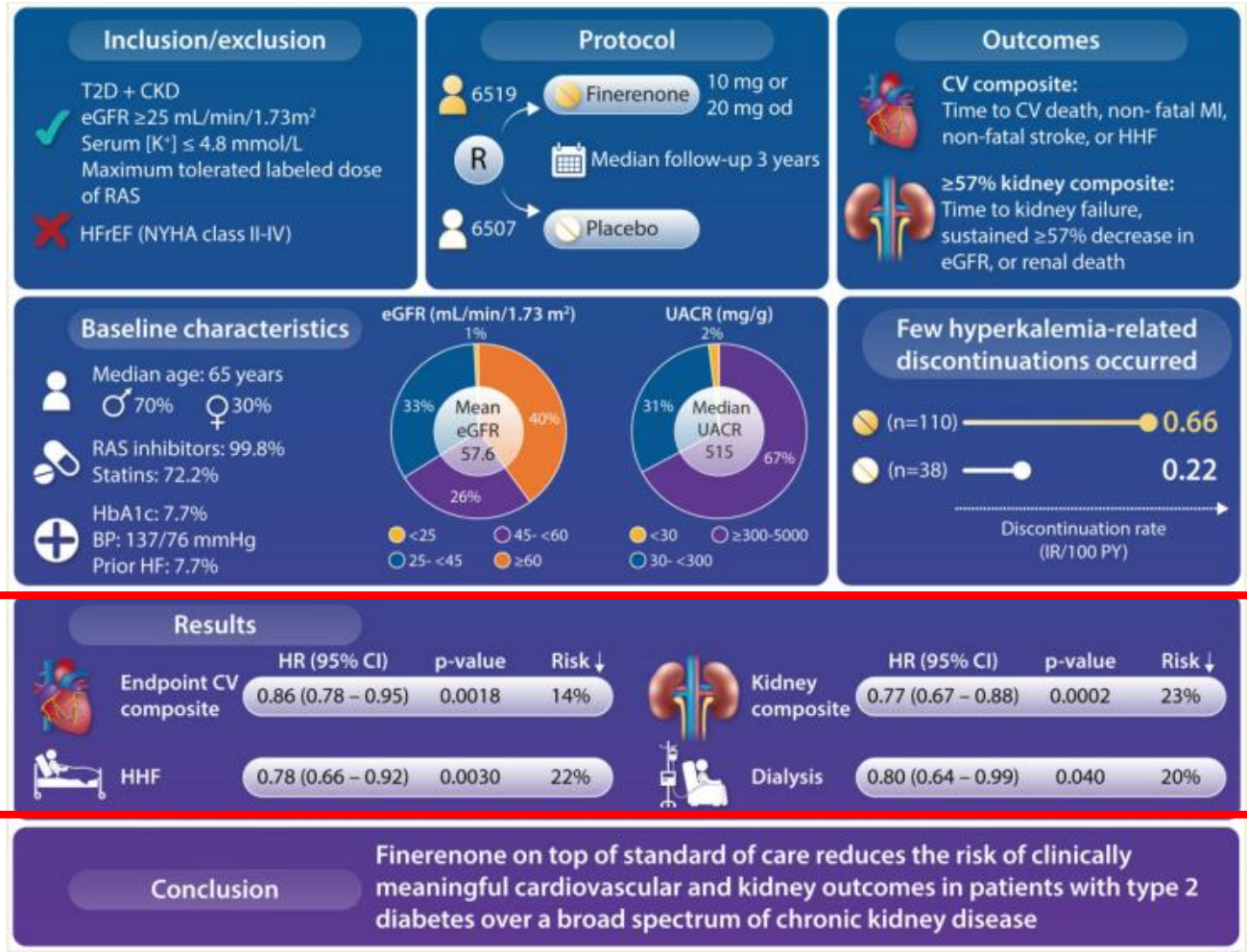
2022 KDIGO guideline (draft)



- ✓ Finerenone: nonsteroidal anti-mineralocorticoid, more selective for mineralocorticoid receptors;
- ✓ Similar potency as spironolactone and specificity as inspra, but less SE.

	FIDELIO	FIGARO
Drug	Finerenone	Finerenone
Participants	5734, 45% CVD	7437, 44.7% CVD
eGFR/UACR criteria	25-60/UACR 30-300 25-75/UACR 300-5000	25-90/UACR 30-300 > 60/UACR 300-5000
Mean eGFR	44	68
Follow up	2.6	3.4
Primary outcome	Composite kidney outcome	4P MACE
Results	HR 0.82 (95%CI 0.65-0.90) *ESRD ↓ 13% (P>0.05)*	HR 0. 87 (95%CI 0.76-0.98)
Others	4P MACE: HR 0.76 (95%CI 0.65-0.90)	Kidney outcome: HR 0.87 (95%CI 0.76-1.01)

Eur Heart J. 2022 Feb 10;43(6):474-484.



Recommendation 1.4.1: We suggest a nonsteroidal mineralocorticoid receptor antagonist with proven kidney or cardiovascular benefit for patients with T2D, an eGFR ≥25 ml/min/1.73 m^2, normal serum potassium concentration, and albuminuria despite maximum tolerated dose of RAS inhibitor. (2A)

- ✓ T2D, eGFR > 25, *albuminuria, and normal potassium*.
- ✓ *Second line after RASi and SGLT2i* (P for heterogenecity=0.41)… Beneficial effects of finerenone were similar among participants treated with SGLT2i or GLP-1 RA at baseline, and there is potentially a lower risk of hyperkalemia when finerenone was combined with an SGLT2i.
- ✓ Normal potassium: < 5.0 mEq/L (FDA), Finerenone was continued with serum potassium ≤5.5 mmol/l, *1.1% severe hyperkalemia (vs 0.2%), 8.8% hyperkalemia (vs 3.8%), and discontinuation 1.7% (vs 0.6%) in pooled analysis.*

Executive summary of the 2020 KDIGO Diabetes Management in CKD Guideline: evidence-based advances in monitoring and treatment

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→ For patients with T2D, CKD, and an eGFR ≥30: metformin (1B), SGLT2i (1A).

→ For not achieved glycemic control or intolerant: long-acting GLP-1 RA (1B).

- 血壓: RAS blockage (1B) for diabetes, hypertension, and albuminuria
- 生活型態: 戒菸 (1D)，運動(每周五次30mins以上的運動) (1D)
- 營養衛教: self-management educational program (1C)

上述最推薦(recommend)~可以到達*grade 1*的等級；

- 低蛋白質飲食: < 0.8g/kg (2C)；低鈉飲食: < 2g (2C)
- Team-based, integrated care (2B)

Life style modification

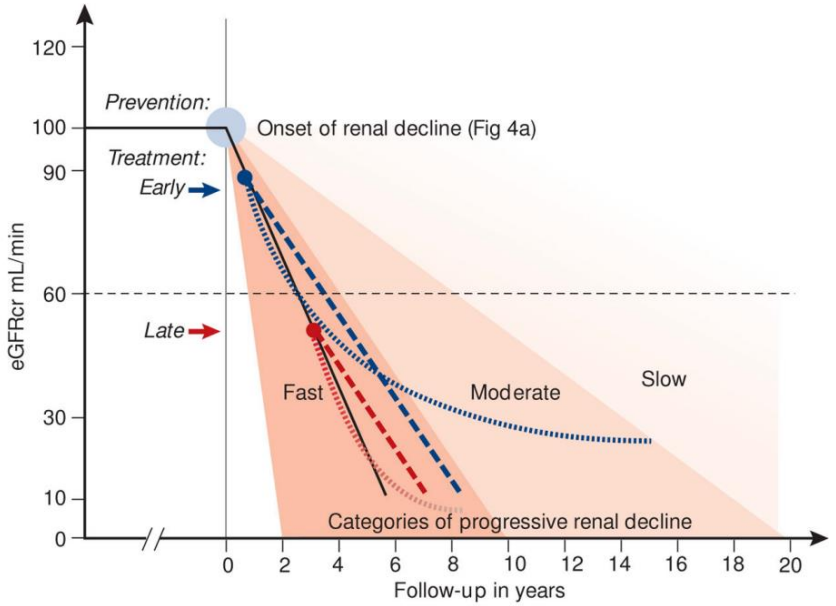
ACEI/ARB

SGLT2 inhibitor

+/- GLP1 agonist

30% CKD progression or ESRD

30% CKD progression or ESRD



Kidney Int. 2017 June ; 91(6): 1300–1311

1. 上述藥物必須在eGFR decline早期就開始使用，效果才會顯著。
2. 即使用上了上述藥物，仍然有0.7x0.7=0.49將近一半的人無效 !!!???

→ Life style and diet intervention.

Healthy Lifestyle and Risk of Kidney Disease Progression, Atherosclerotic Events, and Death in CKD: Findings From the Chronic Renal Insufficiency Cohort (CRIC) Study

Am J Kidney Dis. 2015 March ; 65(3): 412–424.

Four **lifestyle** factors (regular physical activity, body mass index [BMI] 20–<25, nonsmoking, and "healthy diet")

68% all cause mortality

Compared to adherence to no lifestyle factors.

Life style modification: Exercise

- ✓ A prospective study compared the benefits of 6 months regular walking in 40 pre-dialysis patients with CKD Stages 4 and 5, including weight loss, improved cardiovascular reactivity, improvements in uremic symptom scores .

  Nephrol Dial Transplant. 2012 Mar;27(3):997-1004.

- ✓ *Taiwan Study, 6363 CKD patients f/u 1.3 years*. SHR of *walking was 0.67 (P<0.001) for overall mortality and 0.79 (P<0.001) for the risk of RRT.* The SHRs of overall mortality were 0.83, 0.72, 0.42, and 0.41 for patients walking 1–2, 3–4, 5–6, and ≥7 times per week, and the SHRs of RRT were 0.81, 0.73, 0.57, and 0.56, respectively.

  CJASN July 2014, 9 (7) 1183-1189.

Life style modification: Smoking

	Age <70 years		
	HR	95% CI	*P*-value
Smoking			
Never-smoker	1.00		
Former-smoker	3.32	1.23–8.85	0.02
Current-smoker	4.01	1.43–11.25	0.008

	Never-smoking men as reference category		Never-smoking women as reference category	
	Men	Women	Women	Men
Never-smoker	1.00	0.87 (0.20–3.70) *P*=0.9	1.00	1.13 (0.27–4.90) *P*=0.9
Former-smoker	3.74 (1.05–13.20) *P*=0.04	2.77 (0.65–11.95) *P*=0.2	3.19 (0.76–13.52) 0.10	4.30 (1.31–14.05) 0.02
Current-smoker	5.75 (1.46–22.61) *P*=0.01	2.40 (0.52–11.15) *P*=0.3	2.77 (0.64–11.93) *P*=0.2	6.62 (1.73–25.36) *P*=0.01

f/u 10.3 years, 124 of 65,589 participants progress to *stage 5 CKD*. (~0.1%). Baseline eGFR 90-100. Age 50yrs.

Kidney International (2011) 80, 516–523

菸品中含有重金屬，如鎘、鉛會造成腎小管的傷害與萎縮；再者，香菸中的有毒物質會造成腎臟缺氧、腎絲球動脈收縮、以及高血壓，進一步的造成腎絲球內壓力增加，會加速腎絲球的硬化；最後，香菸中造成全身發炎物質與氧化壓力的上升，以及尼古丁會直接造成腎絲球的細胞外間質增生與纖維化。上述諸多問題都會造成及加速腎臟病的進展。

TACD 台灣基層糖尿病協會

慢性病患就地戒菸 成功率6成

2021-05-31 01:41 聯合報 / 特約記者邵冰如／台北報導

台中榮總去年成立戒菸治療管理中心，推動「渥太華模式」，心臟科、新陳代謝科、腎臟科、胸腔科、精神科等主動出擊，醫師門診時把戒菸併入疾病照護常規流程，讓患者「就地戒菸」，戒菸成功率達六十%。

Lancet. 2016 Jun 18;387(10037):2507-20.

戒必適 CHAMPIX varenicline tartrate

- 注意事項:
  - 腎功能不良需減低劑量
    Ccr < 30 ml/min：0.5mg QD 增加至 0.5mg BID
    洗腎病人和末期腎病：0.5mg QD

治療12周，比較起placebo增加3倍的戒菸成功機率!

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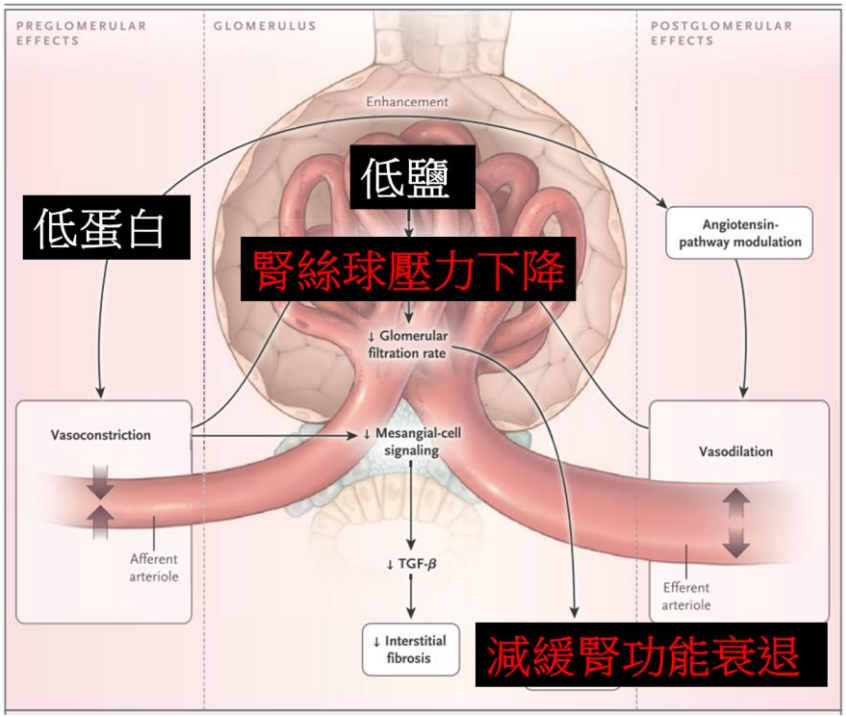
Nutrition: Low salt diet



N Engl J Med 2017;377:1765-76.

In double blinded RCT in hypertensive patients, **low salt diet** for a month, **blood pressure** 159/101 to 151/98 (P<0.01), **Protein excretion** from 93 mg to 75 mg per day (P<0.01)

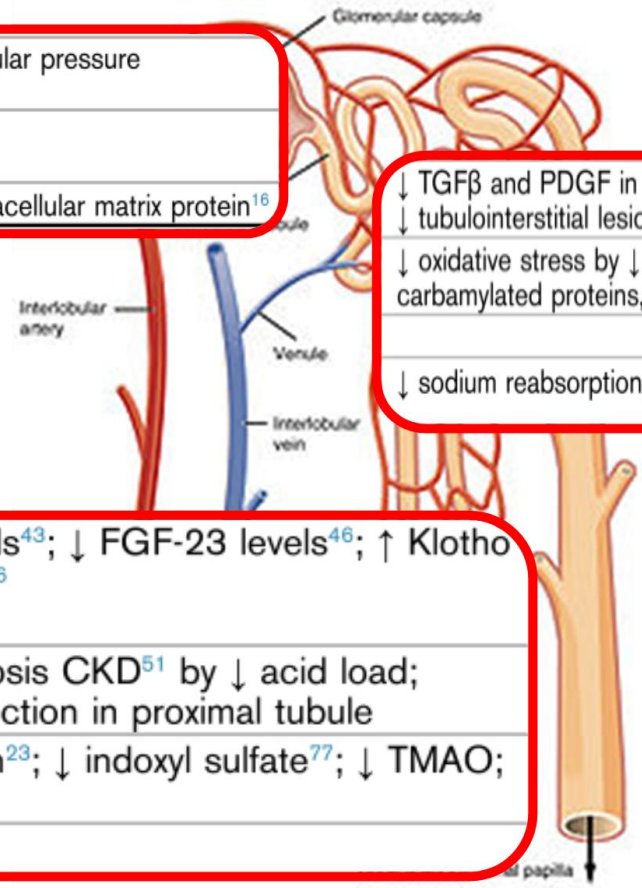
Hypertension. 2005;46:308-312

In double blinded crossover RCT in CKD stage 3-4 patients, **low salt diet** for a month, **blood pressure mean reduction** 10/4 mmHg, **Protein excretion** from 835 mg to 493 mg per day, **Extracellular volume** from 20 to 19.2 L (P<0.01)

J Am Soc Nephrol 24: 2096–2103, 2013.

Nutrition: Low protein diet

低蛋白飲食
學理上的幫助



↓ GFR[1]; ↓ intraglomerular pressure

↓ proteinuria

↓ accumulation of extracellular matrix protein[16]

↓ TGFβ and PDGF in renal parenchyma[20,21]; ↓ tubulointerstitial lesions

↓ oxidative stress by ↓ pro-oxidant toxins (urea, carbamylated proteins, TMAO, indoxyl sulfate)[73]

↓ sodium reabsorption in loop of Henle[70]

↓ phosphate levels[43]; ↓ FGF-23 levels[46]; ↑ Klotho gene expression[46]

↓ metabolic acidosis CKD[51] by ↓ acid load; ↓ ammonia production in proximal tubule

↓ urea production[23]; ↓ indoxyl sulfate[77]; ↓ TMAO; ↓ AGEs

↓ salt intake

KDOQI CLINICAL PRACTICE GUIDELINE FOR NUTRITION IN CKD: 2020 UPDATE

Protein Restriction, CKD Patients Not on Dialysis and Without Diabetes

3.0.1 In adults with CKD 3-5 who are metabolically stable, we recommend, under close clinical supervision, protein restriction with or without keto acid analogs, to reduce risk for end-stage kidney disease (ESKD)/death (*1A*) and improve quality of life (QoL) (*2C*):

- a low-protein diet providing 0.55–0.60 g dietary protein/kg body weight/day, or
- a very low-protein diet providing 0.28–0.43 g dietary protein/kg body weight/day with additional keto acid/amino acid analogs to meet protein requirements (0.55–0.60 g /kg body weight/day)

Protein Restriction, CKD Patients Not on Dialysis and With Diabetes

3.0.2 In the adult with CKD 3-5 and who has diabetes, it is reasonable to prescribe, under close clinical supervision, a dietary protein intake of 0.6 - 0.8 g/kg body weight per day to maintain a stable nutritional status and optimize glycemic control (*OPINION*).

- ✓ **"metabolically stable"** indicates the absence of any active inflammatory or infectious diseases, absence of poorly controlled diabetes and consumptive diseases such as cancer, absence of antibiotic or immunosuppressive medications, and absence of significant short-term loss of body weight.
- ✓ energy intake ranging from 30 to 35 kcal/kg per day helps maintain neutral nitrogen balance and nutritional status.

3.1.1 In adults with CKD 1-5D (*1C*) or post-transplantation (*OPINION*) who are metabolically stable, we recommend prescribing an energy intake of 25-35 kcal/kg body weight per day based on age, sex, level of physical activity, body composition, weight status goals, CKD stage, and concurrent illness or presence of inflammation to maintain normal nutritional status.

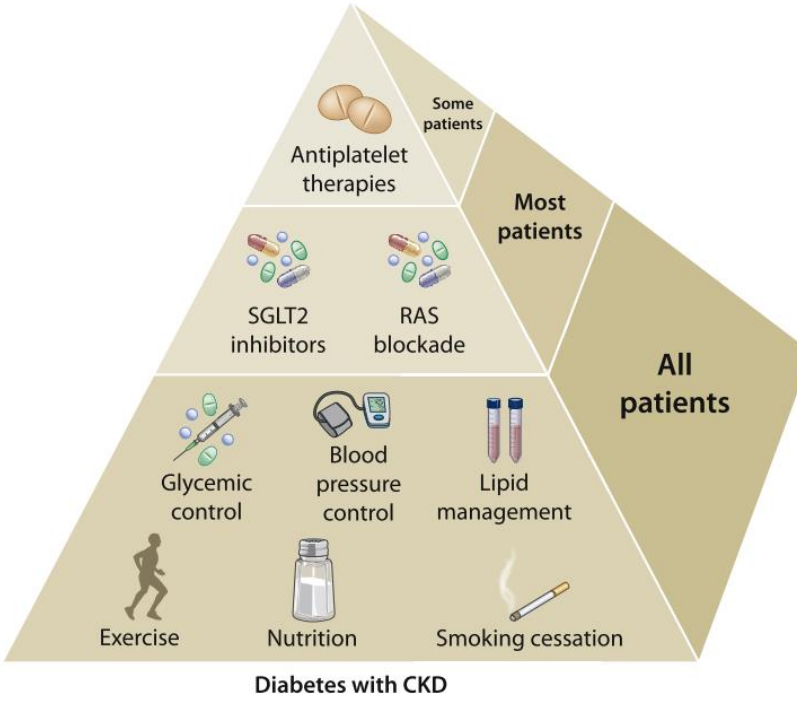
Am J Kidney Dis. 2020;76(3)(suppl 1):S1-S107.

B	第 3 ～ 5 期 CKD 病人應在不會導致營養不良前提下，採行低蛋白飲食，對非糖尿病的 CKD 病人（GFR< 60 ml/min/1.73m^2），每日蛋白質攝取量應控制在 0.8 g/kg/day 以下。		
	統合分析 46 個研究發現，低蛋白飲食能有效減少慢性腎衰竭病人進入透析或死亡危險。 考科藍資料庫整合十個研究、約 2,000 名病人的調查結果顯示，要避免一名病人腎臟失能，需有 2 ～ 56 名病人採行低蛋白飲食。 統合分析 13 個 RCT、1,919 名病人的結果發現，若限制蛋白攝取，每年可減少腎絲球廓清率下降約 0.53 ml/min/yr，已達統計學顯著意義。	1+	17-20
B	併有糖尿病的 CKD 病人若限制蛋白質攝取，可使尿蛋白下降，但對於緩腎功能惡化及對死亡率的影響，則結論不一。		
	統合分析八個針對第一型、二型糖尿病腎病變病人接受低蛋白飲食效果發現，低蛋白飲食無法有效減緩腎功能惡化，但低蛋白飲食組病人糖化血色素控制較好，且尿蛋白有下降趨勢；不過，各個研究異質性高，比較基礎顯有不足。	1+	24

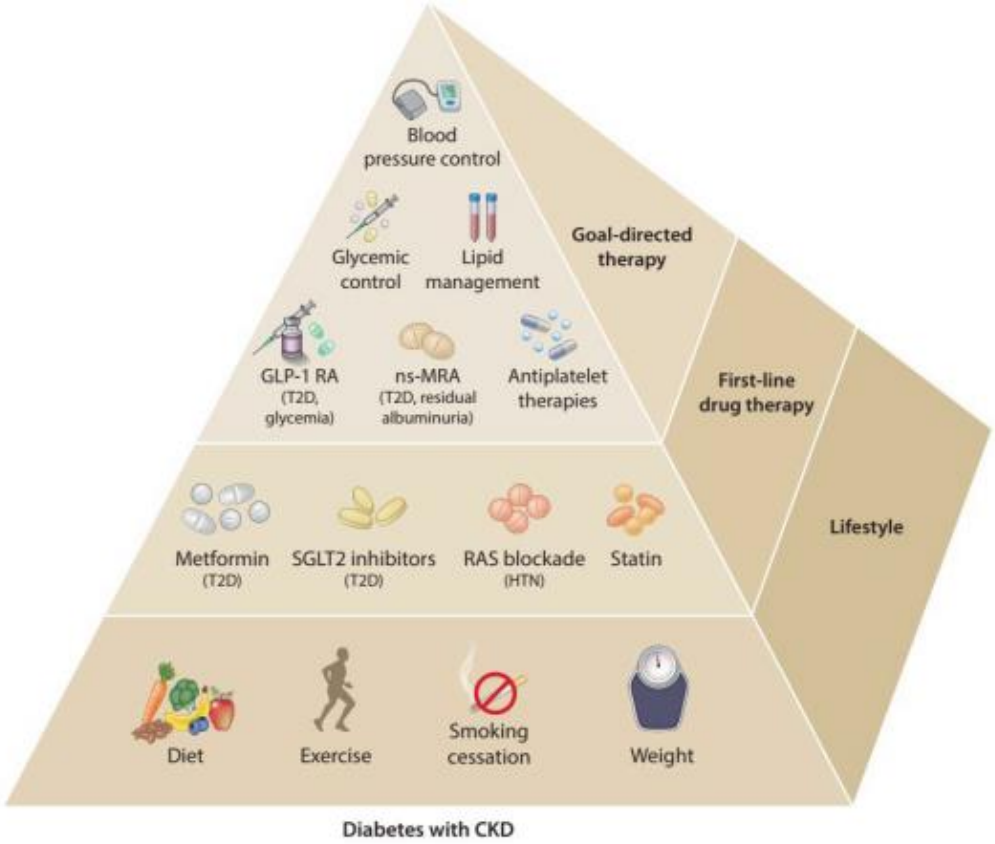
期別	腎絲球過濾率	建議蛋白質攝取量	酮酸療法
一	>/ 90	正常蛋白質攝取	不需要
二	60-89	正常蛋白質攝取	不需要
三	a. 45-59	每天每公斤體重 0.8 克蛋白質	不需要
	b. 30-44	每天每公斤體重 0.6-0.8 克蛋白質	* 考慮使用
四	15-29	1. 每天每公斤體重 0.6-0.8 克蛋白質	* 考慮使用
		2. 每天每公斤體重 0.3-0.6 克蛋白質	建議使用
五	<15 (尚未透析)	1. 每天每公斤體重 0.6-0.8 克蛋白質	* 考慮使用
		2. 每天每公斤體重 0.3-0.6 克蛋白質	建議使用

* 考慮使用：酮酸療法每天每五公斤體重一顆 Ketosteril，並視飲食中蛋白質的生物價值而調整。

2015年 臺灣慢性腎臟病臨床診療指引



Kidney International (2020) 98, 839–848



2022 KDIGO guideline (Draft)

	Study	Intervention	Phase	Key inclusion criteria	Sample size	Primary Outcome	Expected completion date
Kidney outcomes	EMPA-Kidney	Empaglifozin	III	20 ≤ eGFR< 40 ml/min OR 45 ≤ eGFR < 90 ml AND UACR ≥ 200 mg/g	6000	Composite: CKD progression or cardiovascular death	22 Oct
	FLOW	Semaglutide	III	T2DM, HbA1c ≤ 10%, 50 ≤ eGFR ≤ 75 ml/min OR 25 ≤ eGFR < 50 ml/min AND UACR 100–5000 mg/g	3508	Composite: CKD progression or cardiovascular death	24 Aug
Combinations	ZENITH	Zibotentan + dapaglifozin	Iib	30 ≤ eGFR ≤ 60 ml/min	660	Change in log transformed UACR	22 Mar
	MIRACLE	AZD9977 + dapaglifozin	Iib	Stable HF, 30 ≤ eGFR ≤ 60 ml/min, UACR 30–3000 mg/g	540	Change in UACR	22 May
	SAPPHIRE	Verinurad + allopurinol	IIb	eGFR ≥ 25 ml/min, UACR 30–5000 mg/g, T2DM or proteinuria	861	Change in UACR	21 Oct
Anti-inflammatory	MOSAIC	Selonsertib	IIb	T2DM, 20 ≤ eGFR < 60 ml/min, UACR 150–5000 mg/g	310	Composite: CKD progression or kidney death	21 Sep
	FLAIR	AZD5718	IIb	20 ≤ eGFR ≤ 70 ml/min, UACR 200–5000 mg/g	632	Change in UACR	22 Dec
	FRONTIER	MEDI2506	IIb	T2DM, 25 ≤ eGFR ≤ 75 ml/min, UACR 100–3000 mg/g	565	Change in UACR	22 Aug

Endothelin antagonist

Nonsteroid MRA

UA blockade

ASK inhibitor

FLAP inhibitor

IL33 inhibitor

Abbreviations: eGFR, estimated glomerular filtration rate; SCr, serum creatinine; KRT, kidney replacement therapy; ESRD, end-stage renal disease; HR, hazard ratio, T2DM type 2 diabetes mellitus, UACR, urine albumin creatine ratio.

Take Home Message

1. Evidence based medicine!
2. Focus on most important therapy for patients (SGLT2 inhibitors, ACEI/ARB, GLP1 RA, finerenone $\pm$ statin). Earlier in CKD progression.
3. Unmet gap between prognosis and medication…
4. Never forget the necessity of life style modification.

Thanks for attention
Q&A