What is more important : the Kidneys or the Heart?

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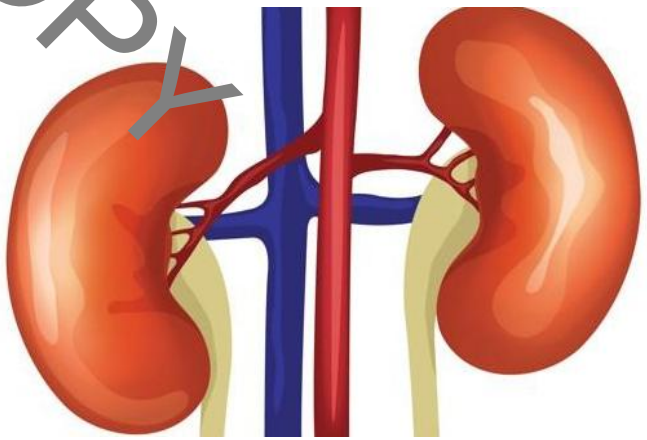
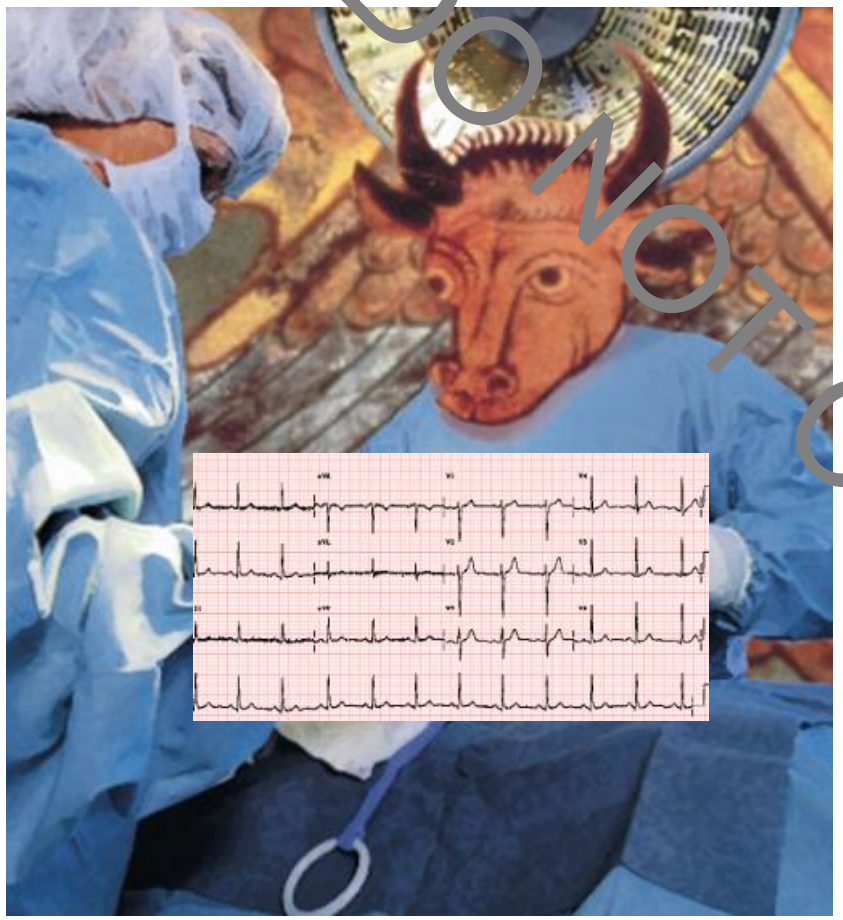
Initial disclosures



Research » Christmas 2011: Surgery

Orthopaedic surgeons: as strong as an ox and almost twice as clever? Multicentre prospective comparative study

BMJ 2011 ; 343 doi: https://doi.org/10.1136/bmj.d7506 (Published 15 December 2011)
Cite this as: *BMJ* 2011;343:d7506

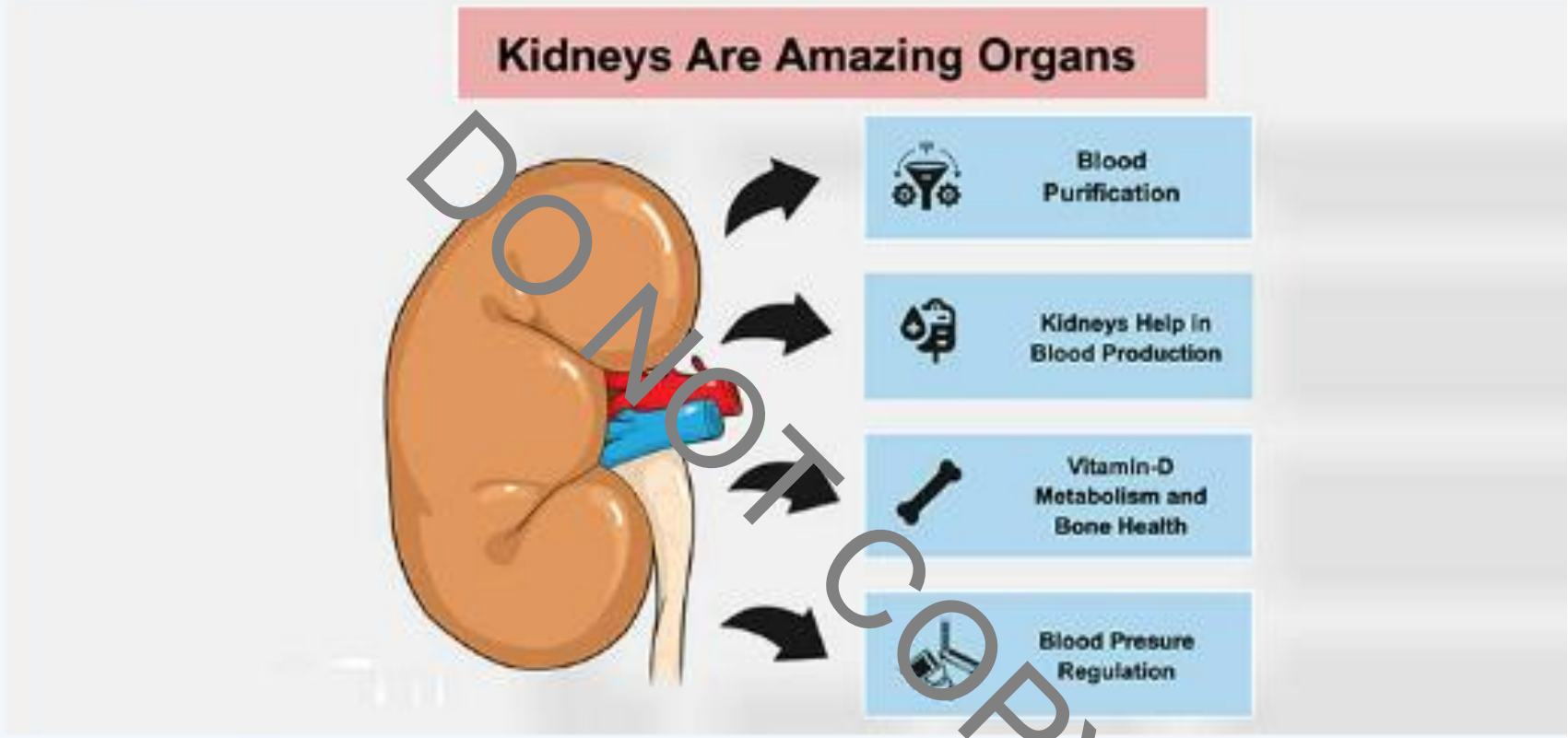


…and defining the double blind clinical trial

Is there really any doubt about which organ is more important!

How amazing are the Kidneys..!

by Dr. Valli | Apr 21, 2020, | How amazing are the Kidneys..!



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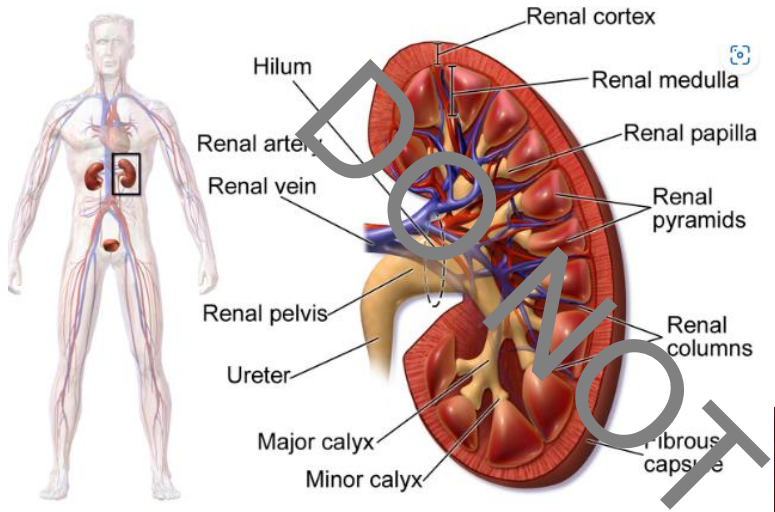
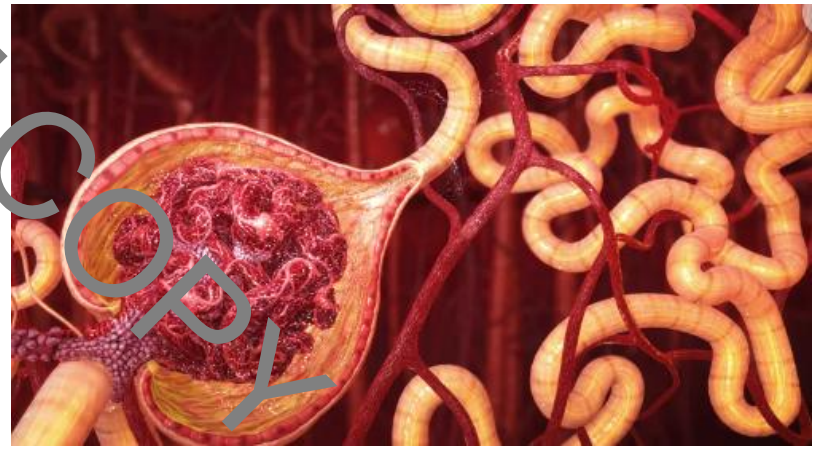


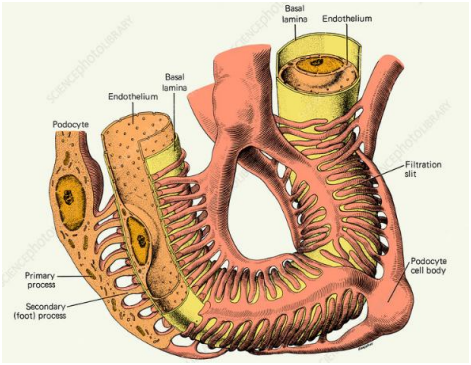
Normal length 8 – 13 cm

Weight ~ 160 gm

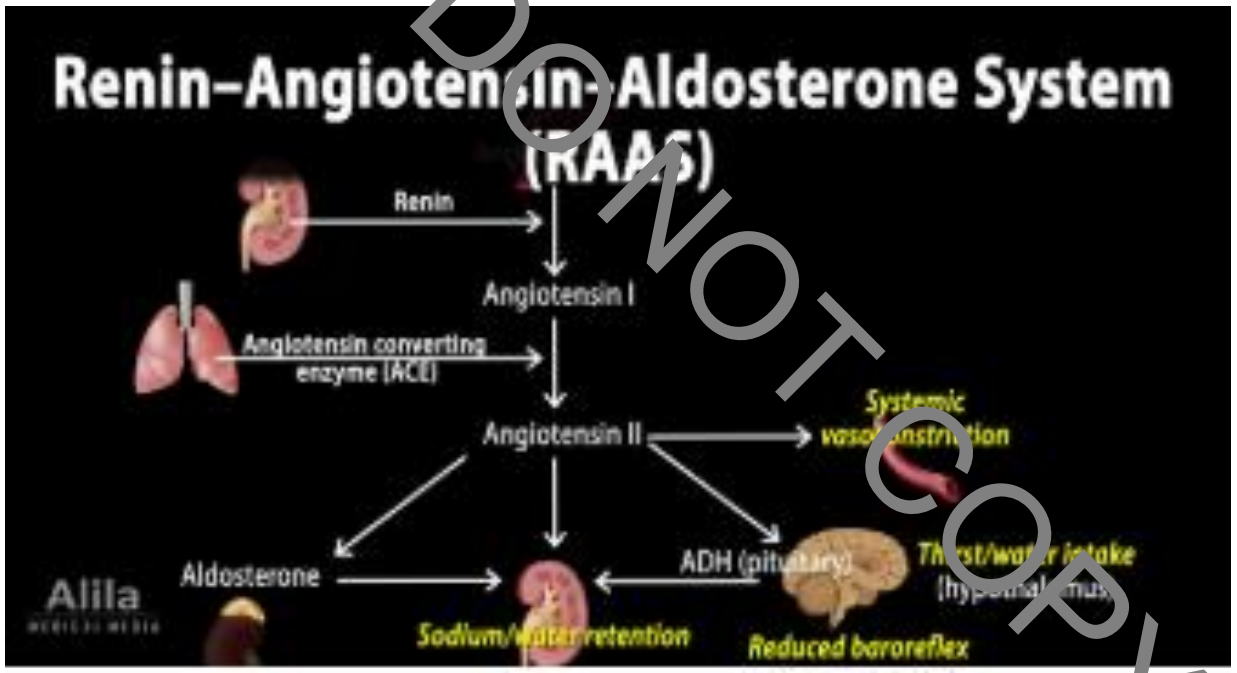
Blood flow 1 – 1.25 litres/min
(25% of cardiac output)



Glomerular capillary and podocyte

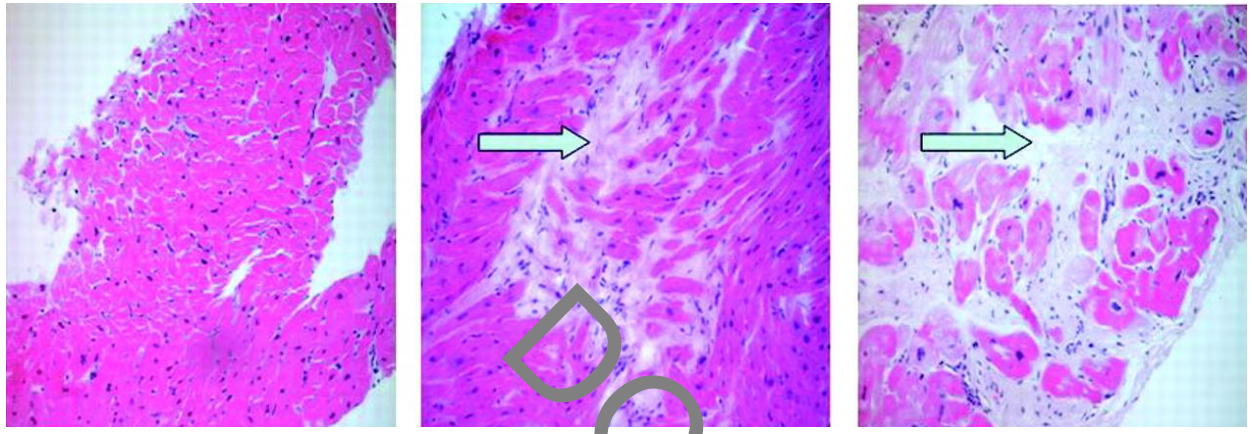


Functions of the kidneys



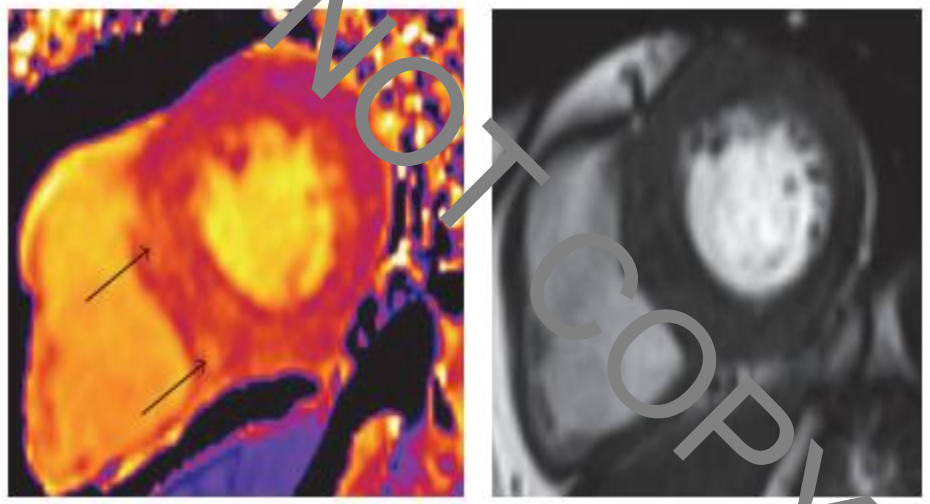
Big role in autoregulation :

- blood pressure control
- salt and fluid balance



And when it goes wrong…..

Myocardial Fibrosis in ESKD

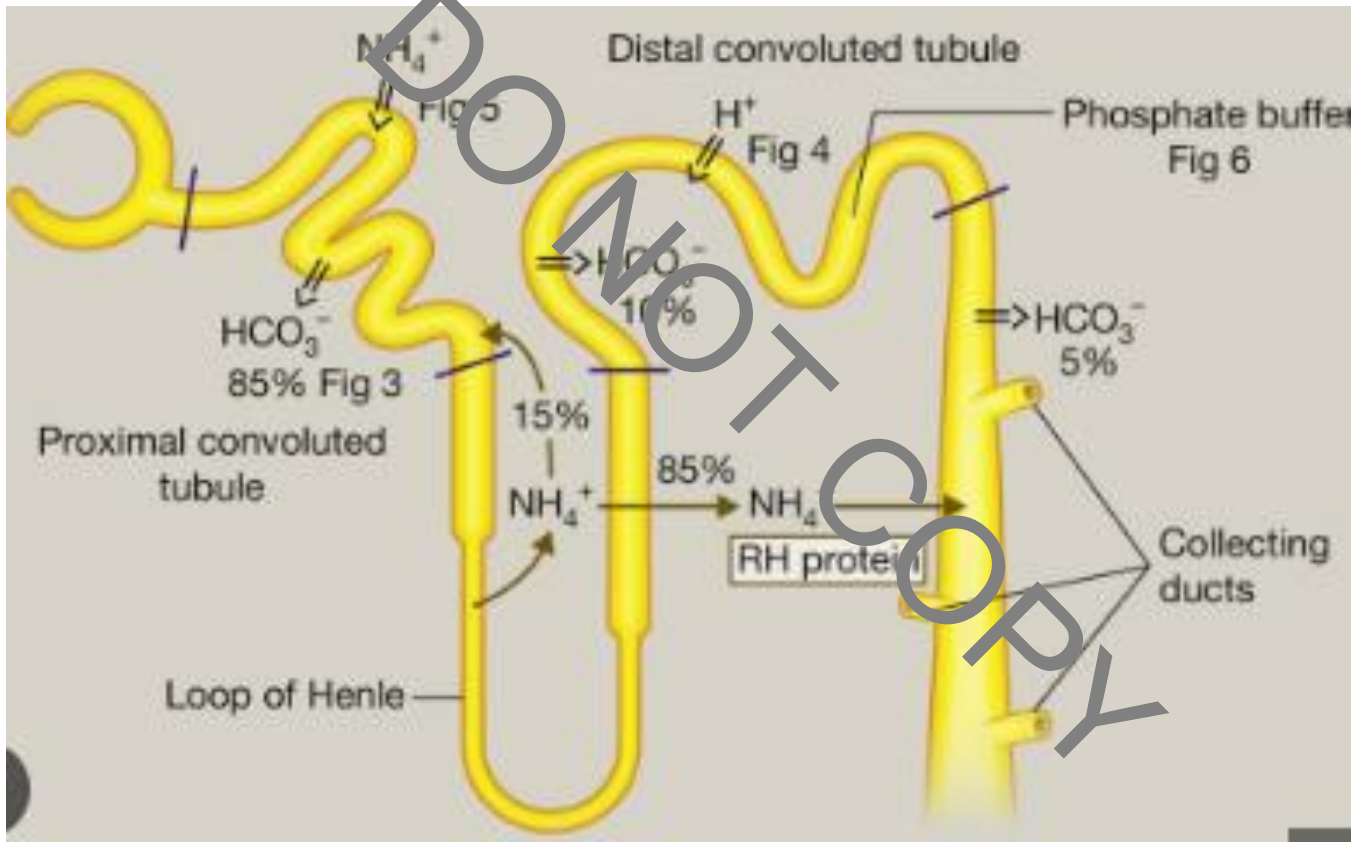


(a) (b)

FIGURE 4: (a) Short-axis midventricular native T1 map of a dialysis patient. Black arrows show areas of discretely increased signal intensity likely to represent myocardial fibrosis. (b) Corresponding short-axis midventricular plain cardiac MRI cine image of the left ventricle of the same dialysis patient. No tissue abnormality visible on plain MR imaging.

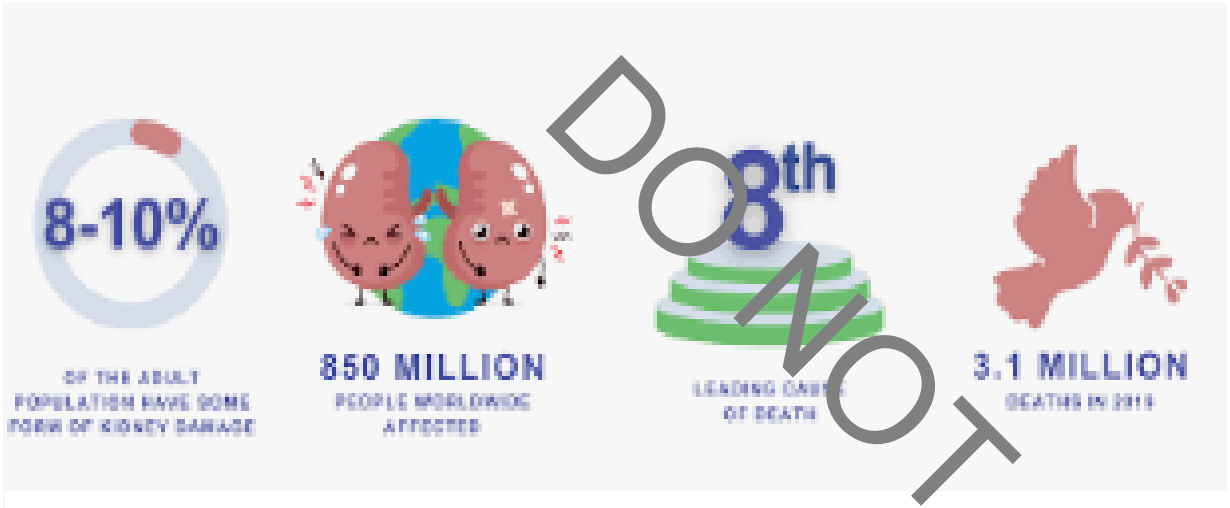
Graham-Brown MPM et al, Biomed Res Int 2017

Functions of the kidneys



Crucial in acid-base balance

Functions of the kidneys



Glomerular filtration of waste

CKD is defined as GFR <60 ml/min/1.73 m² or presence of markers of kidney damage, e.g. ACR ≥3 mg/mmol, for >3 months

GFR categories (ml/min/1.73 m²) description and range			
G1	Normal or high	≥90	
G2	Mild	60–89	
G3a	Mild to moderately decreased	45–59	
G3b	Moderately to severely decreased	30–44	
G4	Severely decreased	15–29	
G5	Kidney failure	<15	

Albuminuria categories description and range		
A1	A2	A3
Normal to mildly increased	Moderately increased	Severely increased
<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30 mg/mmol

INCREASING RISK

INCREASING RISK

Functions of the kidney : Water balance

Where would heart failure management be without a decent diuresis!!

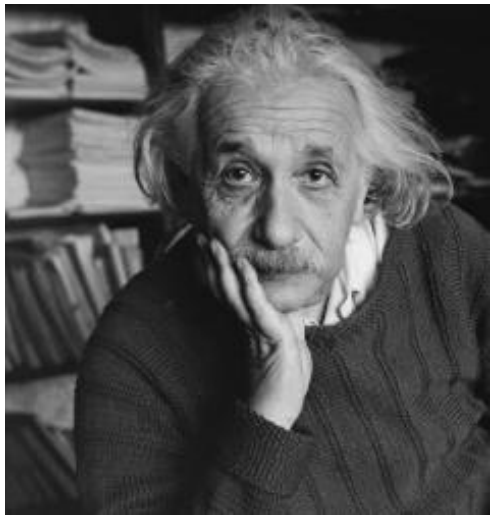
Remind me what the heart does…..

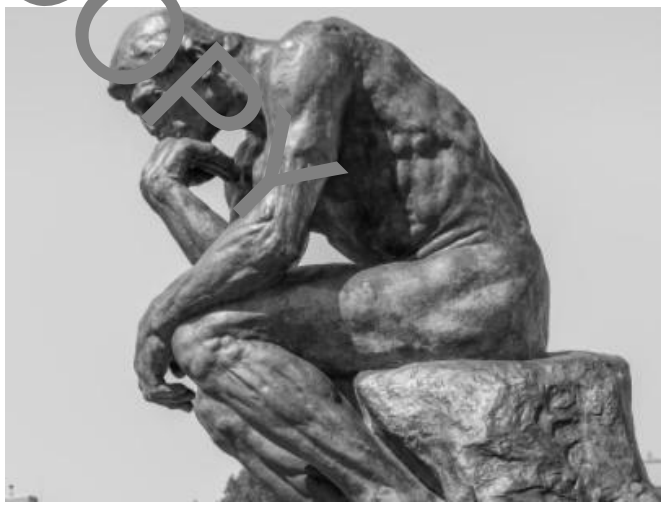
It’s just a pump !!

But to be fair – that pump does feed the kidneys 😂

There’s no competition!!

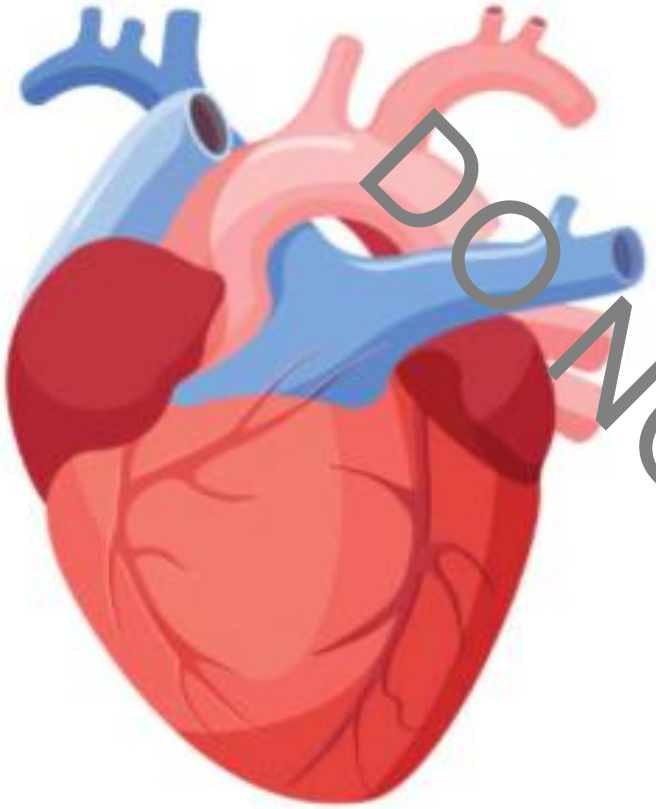
They really are the smartest

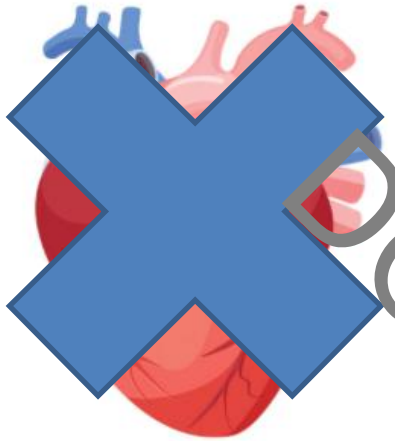


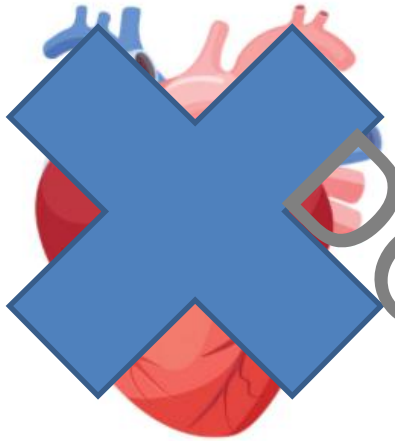


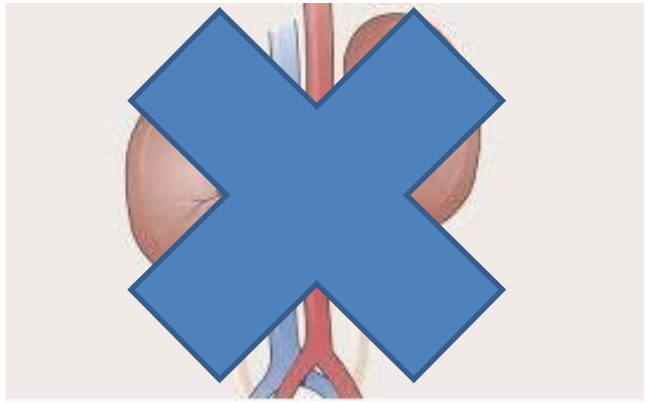
What is more important, the kidneys or the heart?

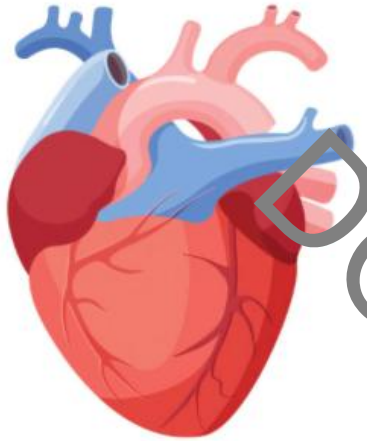
Paul R Kalra
Consultant Cardiologist
Portsmouth Hospitals University NHS Trust

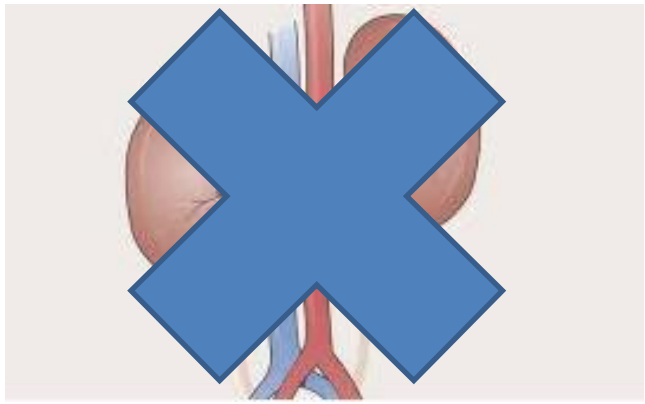


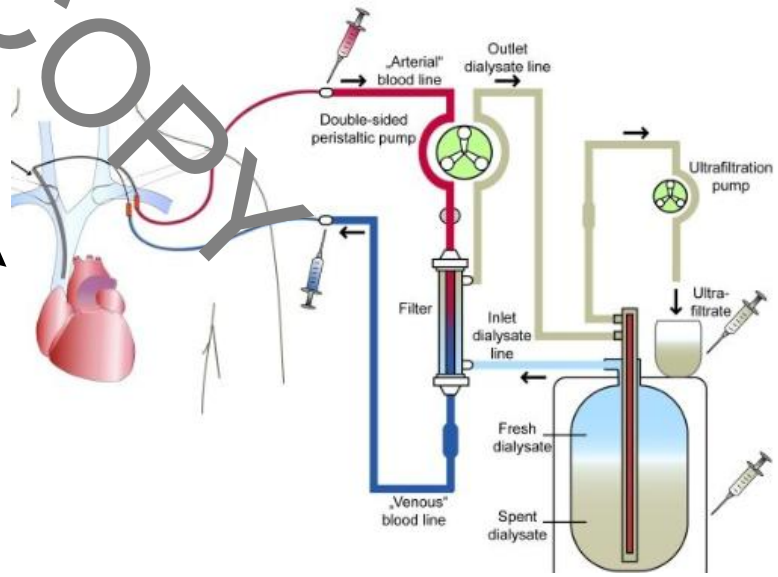




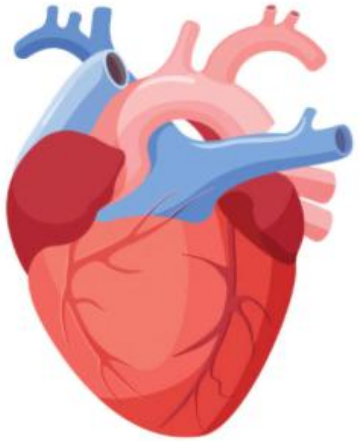







„Arterial" blood line
Outlet dialysate line
Double-sided peristaltic pump
Ultrafiltration pump
Filter
Inlet dialysate line
Ultra-filtrate
Fresh dialysate
„Venous" blood line
Spent dialysate

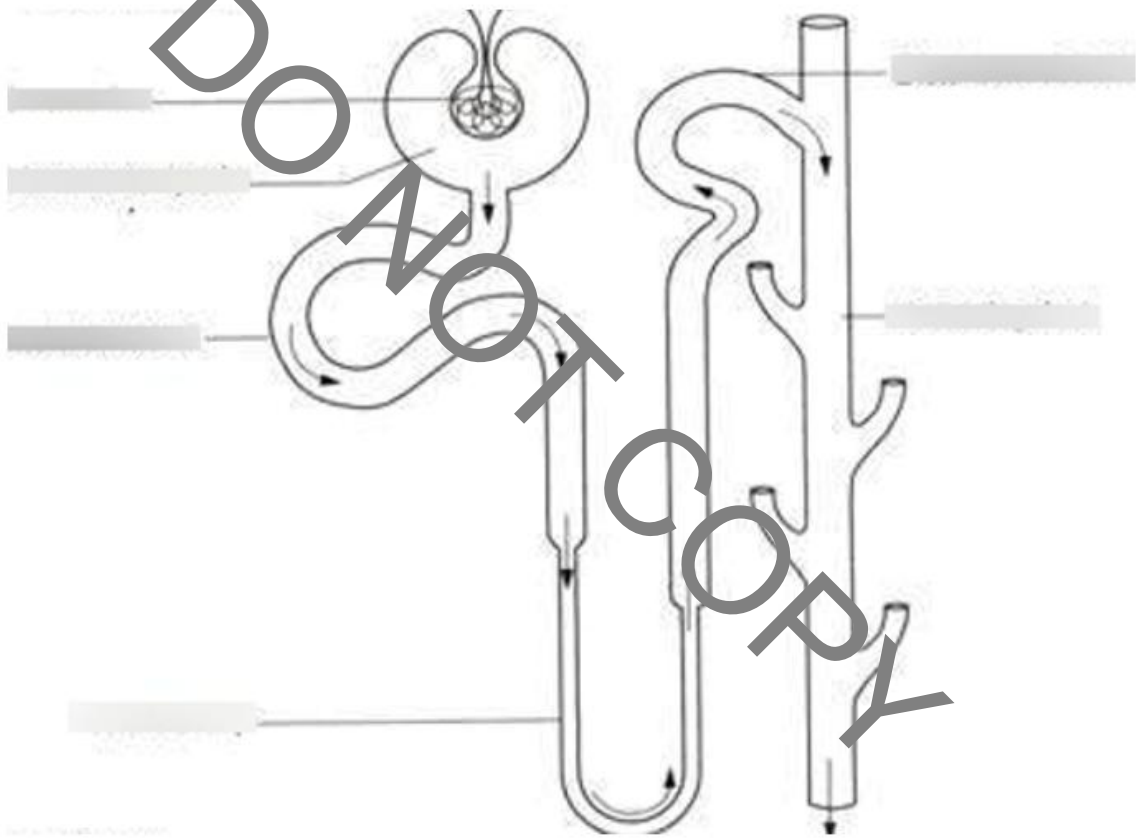
Options to vote now on what is most important…



Acute presentation to ED

- 75-year-old man, HFrEF
- LRTI 2 weeks before and then progressive dyspnoea and leg swelling
- Usual eGFR 40-45, currently 32

Nephron anatomy and blockade



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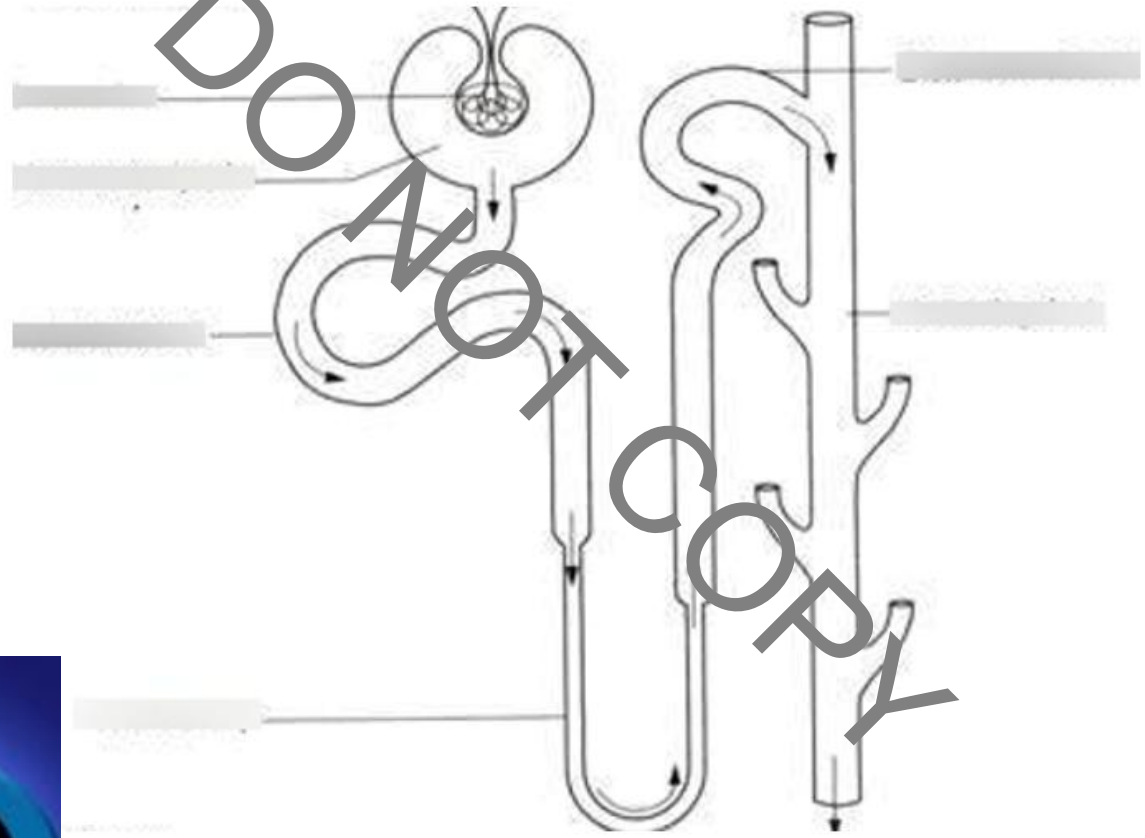
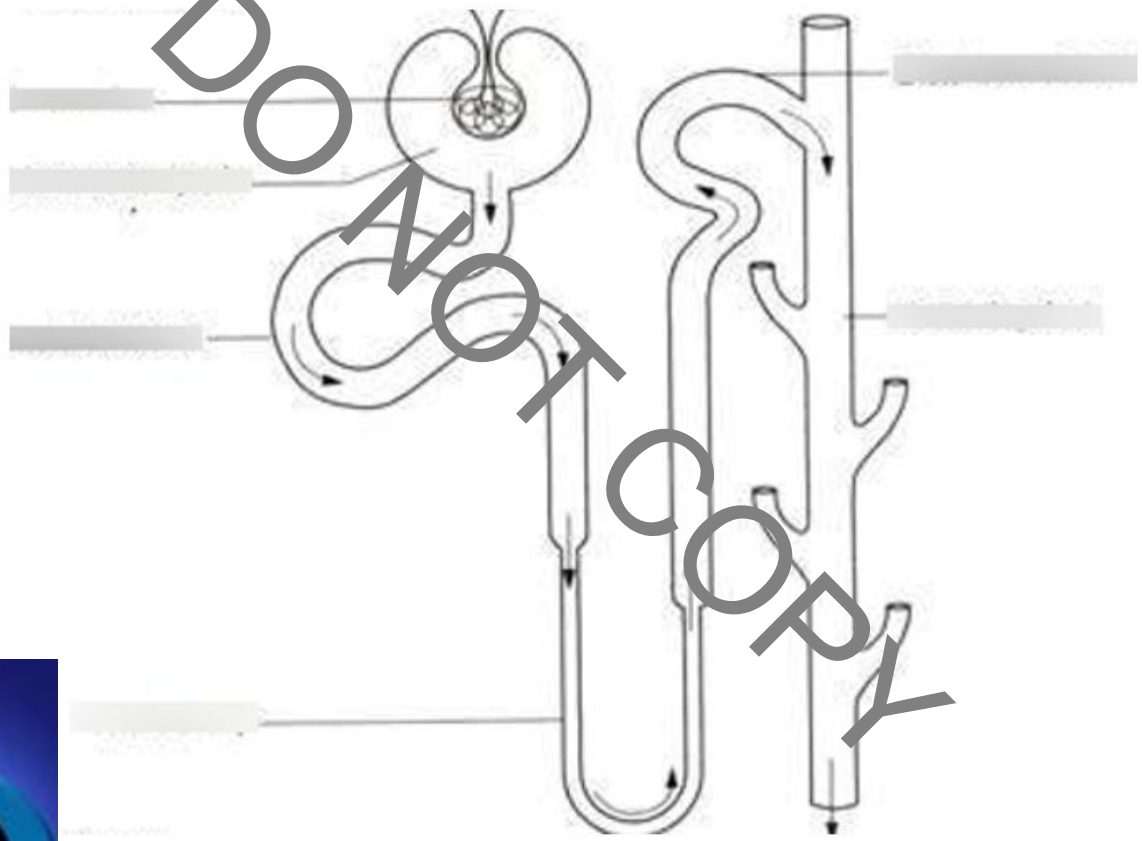
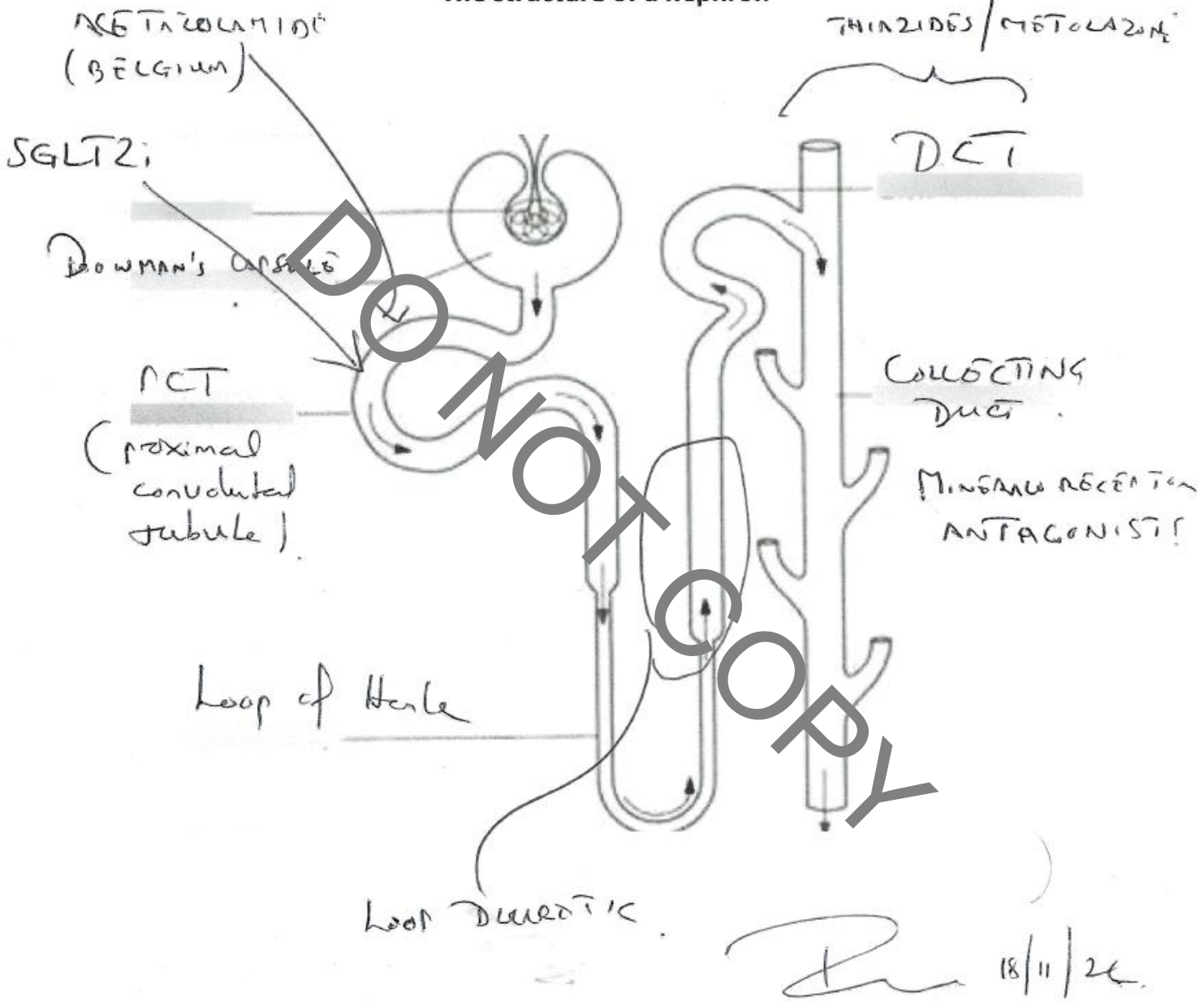


‘Phil mobile’

Nephron function and blockade



The structure of a nephron



Case study: Patient presentation

IBRAHIM,
69-YEAR-OLD MALE
SHOP OWNER

Weight 93 kg / BMI 34 kg/m2

Medical history
- Hypertension and type 2 diabetes for 5 years
- Transient ischaemic attack 2 years earlier
- No regular exercise but working >60 hours/week
- Last reviewed 2 years earlier

Current medication
- Metformin 1000 mg BD
- Linagliptin 5 mg OD
- Gliclazide 80 mg BD
- Irbesartan 150 mg OD
- Amlodipine 10 mg OD
- Atorvastatin 10 mg OD

Current presentation
- Presents complaining of breathlessness on walking uphill and upstairs and some ankle oedema

Blood pressure
- In practice: 158/88 mmHg
- Home monitoring: average 152/90 mmHg from recent readings
- Haemoglobin : 108 g/L

ECG : sinus rhythm, 78/min; normal QRS

NT pro-BNP 675 ng/l

Lipid profile
- Total cholesterol: 5.8 mmol/L
- LDL: 3.3 mmol/L
- HDL: 1.2 mmol/L
- Non-HDL: 4.6 mmol/L
- Triglycerides: 3.2 mmol/L

Liver function
- LFTs:
  - ALT: 42 U/L
  - Alk phos: 97 U/L
  - Bilirubin: 12 umol/l

Renal function
- eGFR: 44 mL/min/1.73 m²
  - Sodium: 136 mmol/L
  - Potassium: 5.2 mmol/L
  - Creatinine: 140 µmol/L
- Urine ACR: 68 mg/mmol

Glucose
- HbA1c: 71 mmol/mol

ACR, albumin:creatinine ratio; ALT, alanine transaminase; AST, aspartate aminotransferase; BD, twice daily; eGFR, estimated glomerular filtration rate; HbA1c, glycated haemoglobin A1c; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LFT, liver function test; OD, once daily; QRISK, Cardiovascular Risk Score; U+E, urea and electrolyte

Cardio-renal-metabolic management

Investigations

- Renal USS : both kidneys ~ 10.3 cm; decreased cortico-medullary differentiation; bladder emptied fully
- Serum free light chains normal
- Ferritin 67 ug/l and TSat17%
- Echocardiogram : LVEF 40% with global hypokinesia

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Key management

- Kidneys : BP control; decrease albuminuria; slow CKD progression
- Heart : 4 pillars of HF management
- CV risk : LDL control, weight loss and exercise
- Metabolic : glycaemic control and weight loss

Evidence based Cardio-renal-metabolic management

Kidney management

- Target BP of ~ 130/80
- maximise Renin angiotensin blockade(RAB)
- irbesartan 300 mg OD (IDNT)
- ± finerenone (Fidelio)
- SGLT2i eg dapagliflozin (DAPA-CKD) or empagliflozin (EMPA Kidney)

Heart failure management

- 4 pillars of HF Rx : RAB; ß blocker; MRA; SGLTi (DAPA-HF and EMPA-Reduced)
- Sacubitril valsartan vs irbesartan (PARADIGM-HF)
- IV iron (IRONMAN)

CV risk management

- Control LDL cholesterol to < 1.8 mmol/l (atorvastatin 40-80 mg OD)
- GLP1 agonist eg semaglutide sc (FLOW)
- Exercise and weight loss

Metabolic management

- SGLT2i
- GLP1 agonist
- Exercise and weight loss
- Aim for HbA1C < 53 mmol/mol

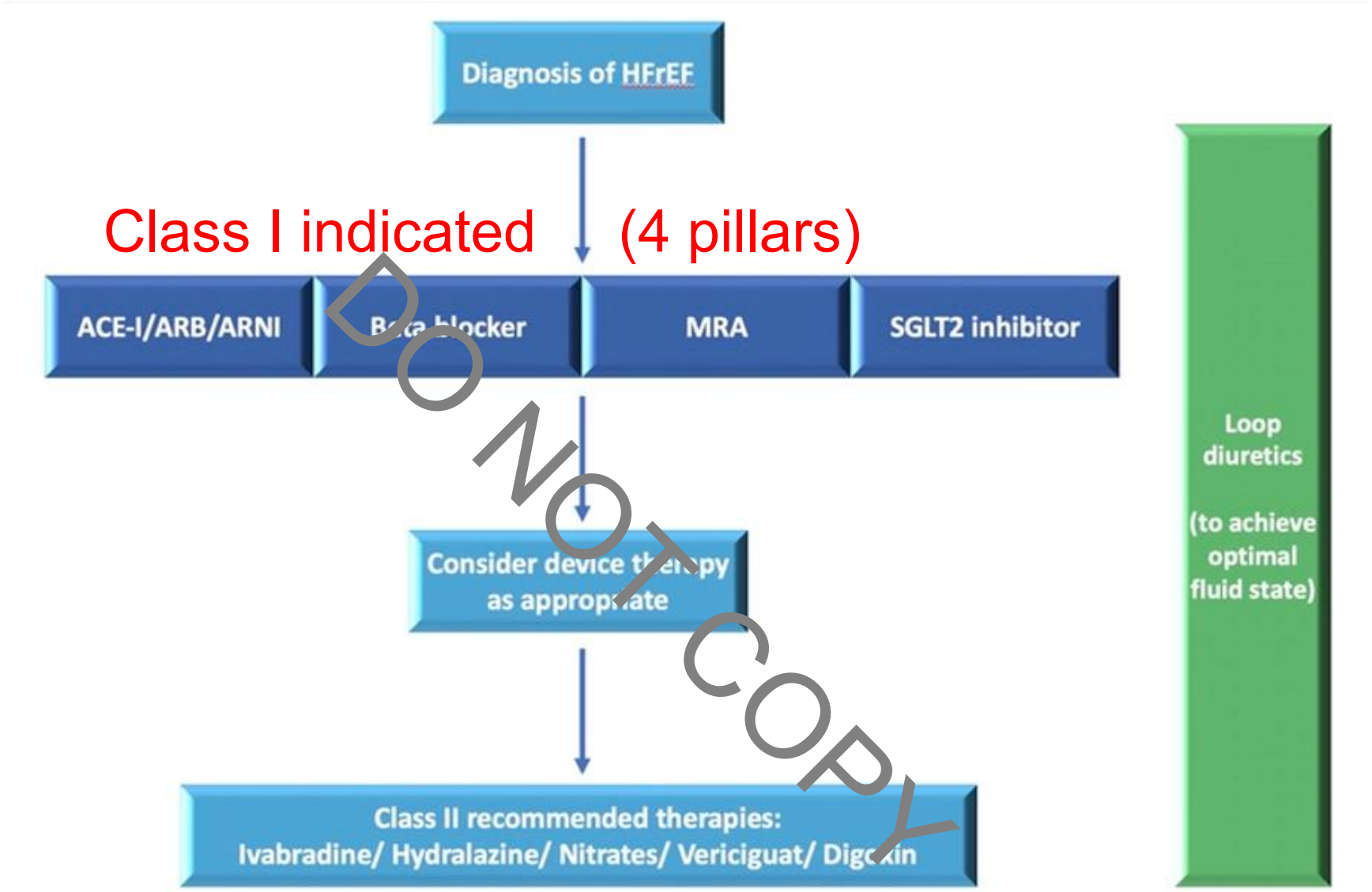

Figure 1. Adapted from 2021 ESC HF guidelines. Algorithm for the management of HFrEF.

Adapted from: McDonagh et at. Eur Heart J 2021;42(36):3599-3726.

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- **Diagnosis: AKI**

Acute presentation to ED

- 75-year-old man, HFrEF
- LRTI 2 weeks before and then progressive dyspnoea and leg swelling

- Usual eGFR 40-45, currently 32
- **Diagnosis: high risk heart failure with AKI**

CKD is an independent predictor of adverse outcome in CHF

CHARM: Adjusted rates of CV death or hospitalisation for CHF (n=2680)

eGFR (mL/min/1.73m²)		Hazard ratio	95% CI	P
≥90	(n=577)	1.00	…	…
75–89.9	(n=519)	1.17	0.93–1.49	0.180
60–74.9	(n=618)	1.24	0.98–1.56	0.070
45–59.9	(n=547)	1.54	1.22–1.94	<0.001
<45	(n=419)	1.86	1.47–2.36	<0.001

Hillege H et al. *Circulation 2006*

CHARM, candesartan in heart failure assessment of reduction in mortality and morbidity; MDRD, modification of diet in renal disease; CHF, congestive heart failure

Decongestion, decongestion, decongestion

- Congestion is awful for patients and for the kidneys
- Need much higher dose than usual dose (irrespective of if oral or IV)
- Low dose if renal function OK and diuretic naïve
- If no improvement, then step up therapy (combination of loop, SGLT2i, MRA and thiazide)

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FACTS

Angiotensin converting enzyme inhibitors, angiotensin receptor blockers, mineralocorticoid receptor antagonists, SGLT2 inhibitors are NOT nephrotoxins

They are indeed nephroprotective drugs

(that affect renal blood flow)

Change in renal function associated with drug treatment in heart failure: national guidance

Andrew L Clark, Paul R Kalra, Mark C Petrie, Patrick B Mark, Laurie A Tomlinson, Charles RV Tomson

Consensus statement from the British Society for Heart Failure and the Renal Association

Heart 2019;**105**:904–910.

Management of renal function during initiation of RAAS inhibitors

Table 1 Management of RAAS inhibitors in response to change in renal function

Clinical assessment:

- Compare with baseline renal function (review series of results).
- Assess fluid status: if intravascularly depleted (jugular venous pulse not visible, postural drop in BP and no oedema), consider cautious intravenous fluids.
- Interpret BP in the context of usual values (low BP does not necessarily mean patient needs fluid).
- Reduce/withdraw RAASI if symptomatic hypotension.
- Repeated clinical and biochemical assessment is vital.
- Presence of moderate or severe hyperkalaemia may override recommendations based on change in renal function.
- In severe renal dysfunction assess for symptoms or uraemia.

	Recommendations for RAAS inhibitors	
Change in renal function compared with baseline	**HFpEF (assuming no other prognostic indication).**	**HFREF.**
Increase in serum creatinine by <30%	Consider stop ACEI/ARB/ARNI Review MRA according to fluid status.	Continue unless symptomatic hypotension.
Increase in serum creatinine 30%–50%	Stop RAAS inhibitor.	Consider reducing dose or temporary withdrawal.*
Increase in serum creatinine >50%	Stop RAAS inhibitor.	Temporarily stop RAAS inhibitor.*
Severe renal dysfunction, for example, eGFR <20	Stop RAAS inhibitor.	Stop RAAS inhibitor if symptomatic uraemia irrespective of baseline function.

*Reinitiate and/or retitrate when renal function improved in patients with HFrEF

Heart 2019;**105**:904–910.

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