Renal medicine and Haemodialysis in plain language.

A Primer for kidney patients to explain contemporary Renal Medicine, what works, why it works and the benefit.

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Renal Medicine, Dialysis and Transplantation, in plain language.

"Humans are not very good facing up to what they cannot control themselves. If too big, someone else has to deal with it."

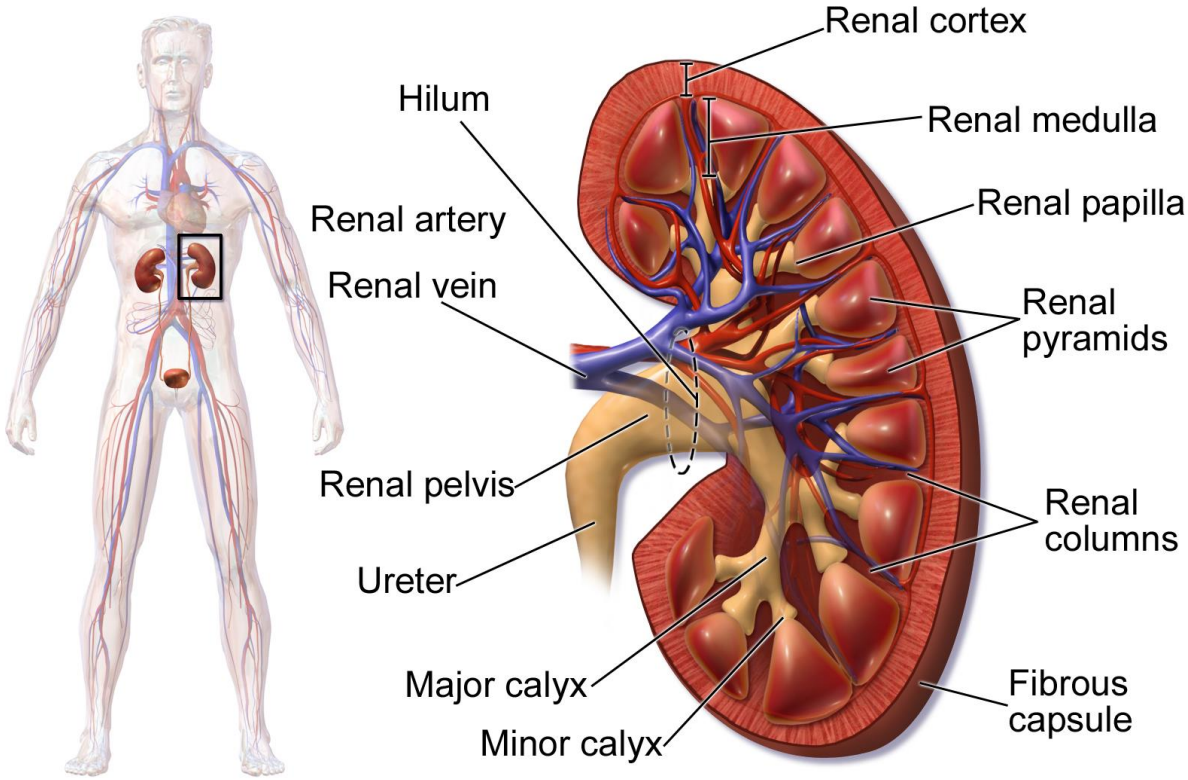
(From Who Owns History, by Geoffrey Robertson)

This is not a medical textbook but an informative text, to help you take control of your medicine.

This work is for renal patients. There have been many over 40 years, scores have done the hard yards to dialysis and transplantation.

The book is to plainly explain the complex practice of renal medicine.

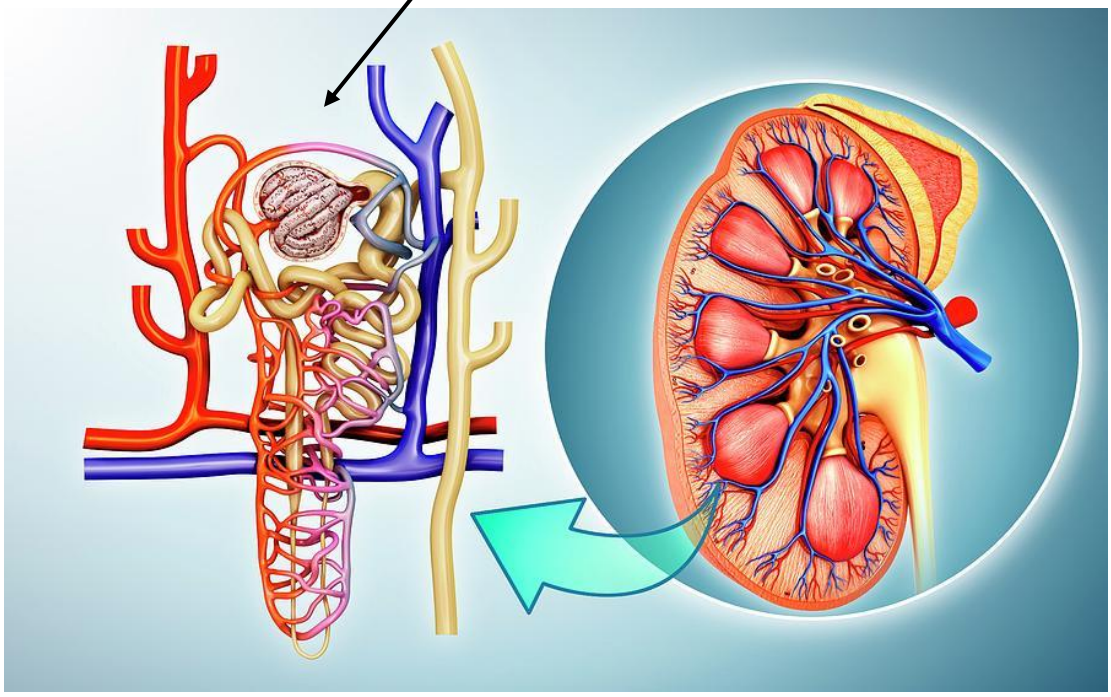
This is not an academic book. The contents are based on medical evidence, but the translation is conversational.



Kidney Anatomy

The fundamental filtration unit of the kidney is the **Nephron.**

Usually, **one million** in each kidney



Overview

Kidney disease provokes anxiety in the patient and referring doctor alike. The broodlings of the unknown nourishes the patient's concern, and the looming medical minefield taxes the doctor.

The academic teaching of kidney medicine is complex, lapses shortly post- graduation, particularly if the hospital junior trainee doctor does not do a kidney term.

General Practitioners rely on published guidelines "to know the next step". These guidelines may be historical. Evidence-based practice is the **Gold Standard** in patient care; it may take years (reported to be up to 17 years) for hospitals, clinics and some doctors to adopt practices or treatments after the first established evidence of patient benefit. Medical progress oozes into practice, it is not posited.

(An example is the SGLT2 inhibitor discussed below. The Medical evidence that these medicines retarded the deterioration of Renal Failure was in 2012; They were accepted on the PBS on 31 August 2022-10 years later)

Google and armchair advisers are interesting and may be helpful.

Ensure your information is accurate. Many scientific studies on the Internet have excluded Kidney patients. This has confused legions of armchair experts.

The Clinical Study you read on Google must have application to you as a Renal Patient. Working out what is applicable to you is not always easy.

There is much Tradecraft involved in the practice of Renal Medicine. It is said 80% of Renal Practice is not evidenced based; the Nephrologist sometimes rely on what is known to work, (or not work).

There is much medicine that is **counter-intuitive**! For example, correcting Renal Anaemia makes the patient feel good, but does not slow renal deterioration. Early dialysis does not improve outcomes!

WOOLLY THINKING

MAKE SURE YOUR DOCTOR EXPLAINS THE MEDICINE, THE SCIENCE BEHIND IT, AND THE MANAGEMENT PLAN

To assess whether a scientific paper is relevant to you as a patient you must ask a question.

AM I IN THAT GROUP OF PATIENTS TO WHICH THE RESULTS APPLY?

Frequently you are not. The clinical trial excluded Kidney patients, or included a population distinct from you

Renal Medicine is the most complex and difficult of Internal Medicine disciplines, intellectually tough and challenging, and more is required to explain a disease and its treatment to the patient.

Patients with any renal abnormality should be assessed by a Renal Physician. Unfortunately, this is not done, and delayed diagnosis is the harbinger of bad of futile medicine. Early treatment affords the best outcomes. You will actively have to ask your general practitioner to do kidney tests, and if you are at risk, get your doctor to refer your case to a nephrologist. Remember, risk does not only include abnormal kidney tests, whether you suffer diabetes or hypertension, or have a family history of renal disease, and in particular aboriginal persons and Torres Strait Islanders should be assessed by a renal physician.

Continuity of care wilts in General Practice, so anchoring your complex care with a Renal Physician, has never been more important!

Diagnosis is the doctor's job, based on evidence and experience. A Doctor's educational renewal should be continuous because of the rapid progression of contemporary Kidney Medicine.

Doctoring

“One who is a close reader of illness and a good critic of medicine.

Someone who can treat body and soul.

To get to my body, my doctor has to get to my character.

He has to go through my soul.

I see no reason or need for my doctor to love me.

Nor would I expect him to suffer with me.

I just wish he would brood on my situation for perhaps 5 minutes.

He would give me his whole mind just once.

Be bonded with me for a brief space, survey my soul as well as my flesh.

To get to my illness.

For each man is ill in his own way.”

(Source unknown)

Renal Medicine is a long journey and frequent supervision for the patient

You have a chronic disease which will reduce your lifespan. Renal Physicians have crafted and medically sophisticated skills and these include affording empathy and sympathy.

Chronic disease is a whole of life experience. Choose your Kidney Doctor wisely.

You may have that doctor for the duration.

Both are informed of each other

The doctor's **administrative competence** is important.

Consultations may be frequent.

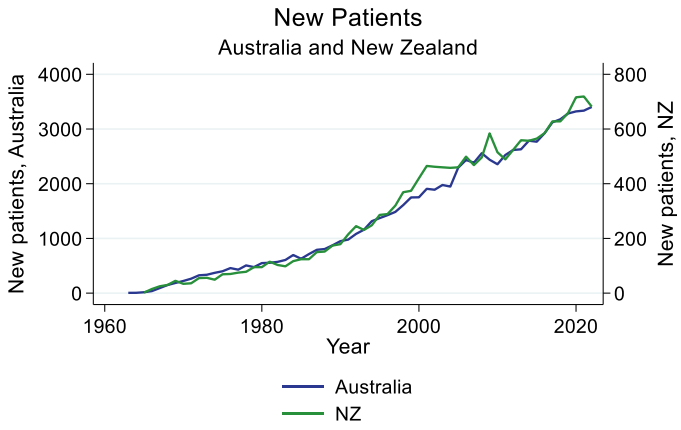
A capacity to put in time (an essential ingredient of Chronic Illness).

Commands a smooth responsive infrastructure, not straight jacketed by poor secretarial assistance or housekeeping.

A doctor who returns your calls!

Unsettling Australian medical facts. 1.5 million Australians don't know they have kidney disease, about **1 in 3 adults** have some chronic renal failure; if you're over the age of **65** with diabetes hypertension or a family history of kidney disease, you probably have chronic renal failure and should be assessed by a Renal Physician. About **1 in 9** Australians die of Kidney failure

Dialysis and Kidney Transplantation



2023 ANZDATA Annual Report, Figure 1.1

Renal Medicine has entered a “Golden Age”; for the first time there are effective treatments for Renal Failure, Diabetes and Cardiac failure. These diseases interact, the treatments overlap, and a correlative management plan is required.

Historical medical treatments have been woeful. Contempory and future treatments promise a much better outcome.

In **Kidney Medicine**, Hypertension treatment with ACE inhibitors and Angiotensin receptor blockers, retarded kidney failure.

With the introduction of SGLT2 (Empagliflozin and Dapagliflozin) inhibitors and GLIP-1 Analogues (Semaglutide and Tirzepatide) over the last 10 years, drugs originally designed for diabetes, but now fundamental to the treatment of Kidney and cardiac disease, with strong positive outcomes retarding the decline in Kidney function and cardiac disease.

In **Diabetes,** treatments have been a massive disappointment over 60 years. Controlled scientific studies 23 years ago (Randomized Controlled Trials) of type II diabetes showed the woeful state of affairs. The very best control of diabetes (tight HbA1c control) produced little difference in Heart Attacks or Strokes (a common outcome for diabetics), and a 10% difference in diabetic kidney and retinal disease, and mostly as a legacy over 25 years.

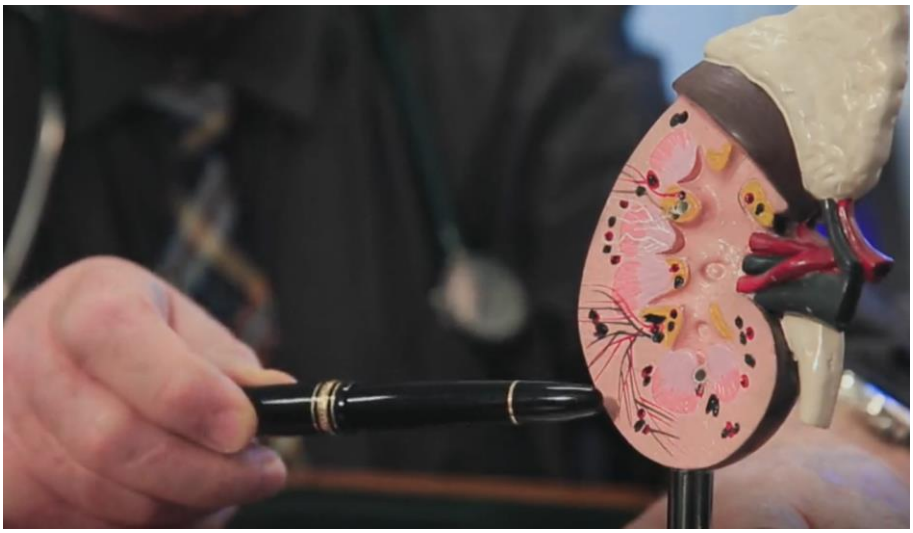
A conceptual change in diabetes is a blood vessel not a glucose disease; this sparked a profound rethink.

With SGLT-2 inhibitors, and Glip-1 analogues together with tight LDL cholesterol and Blood Pressure control to treat as a whole body not just a suger disease, the management and prognosis of diabetes has markedly improved.

In **Cardiac Failure** treatment was beta-blockers, diuretics and lots of prayer. Nothing seemed to work. With SGLT2 inhibitors, Glip-1 analogues combined with other cardiac medication (Known as MRA and ARNI medication), the outcome is at least 25% better and extend longevity by 6 years).

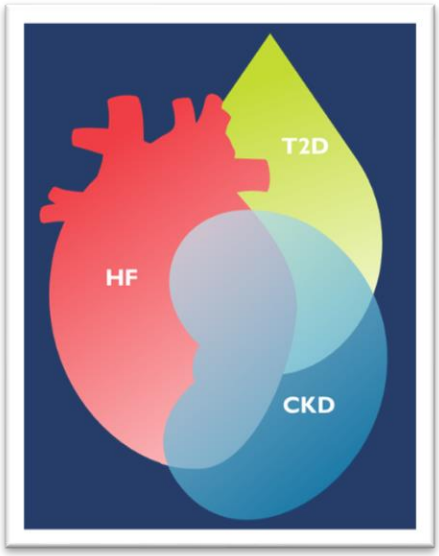
Because all these modern medications overlap, the Kidney Doctor has interest in everyone's business. **The Kidney Physician** is best situated to correlate treatments across many

diseases’ frontiers. The Cardiologist, Endocrinologist and Renal Physician should **all** be experts in each other’s fields!



Integrated complex medicine

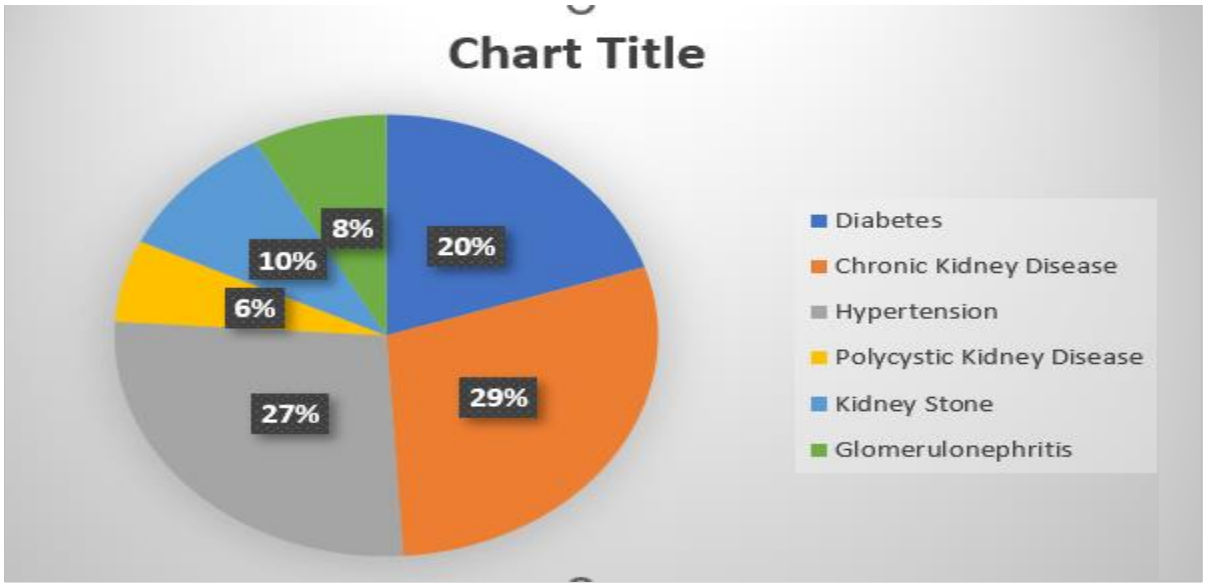
Renal Physicians are well placed to correlate complex medicine



Correlated treatment of Renal, Diabetic and Cardiac Disease…….

Because the contempory treatments of these diseases largely overlap.

The Scope of Practice at Kidney Life



Kidney Medicine in ACT/NSW FAR SOUTH COAST over 8 years

Kidney Medicine at Kidney Life (Peter Yorke Building) and Access Nephrology Far South Coast

Hemodialysis at the Yorke Dialysis clinic (ACT)

Kidney Transplantation in conjunction with Royal North Shore Hospital ACT and NSW Far South Coast

Chronic Kidney Failure

Three Management concepts!

A – Treat the primary kidney disease if that is possible. Very few kidney diseases are amenable to **specific** treatment (5%). Some forms of **glomerulonephritis and interstitial nephritis** are treatable*. Treatment would follow a kidney biopsy. Kidney stones are treatable.

B – Treat hypertension, use medications that improve kidney function. Reduce weight (with Semaglutide or another GLIP-1 analogue if necessary)

C – Treat LDL-cholesterol (opinion differs as to the extent, generally to an LDL < 1mmol/l) and abnormal sugar metabolism.

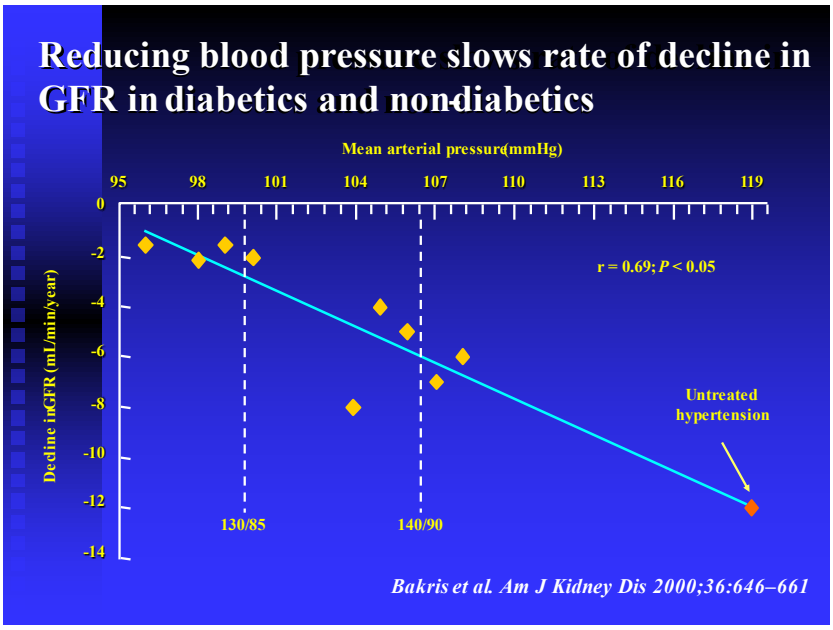
*** [Treating glomerulonephritis or interstitial nephritis.**

Medications include prednisone, azathioprine (Imuran), Mycophenolate (Myfortic), cyclophosphamide, rituximab, intravenous immunoglobulin, plasmapheresis.

The details of these treatments would not be helpful to you.**]**

Treating hypertension

This is the **mainstay** of kidney failure treatment. **It slows up the deterioration in renal failure!**



Reducing Blood Pressure reduces CRF progression generally

The Australian standard, particularly with proteinuria, is a blood pressure measured in clinic, on most occasions, of **120/70** or below.

There are no “too low” blood pressures unless you suffer symptoms of dizziness and faintness when standing up; that is, postural hypotension.

Blood pressure treatment may require several medications; the therapeutic management **concept** is using several drugs lowering blood pressure in different ways but in low dosage and avoiding side-effects.

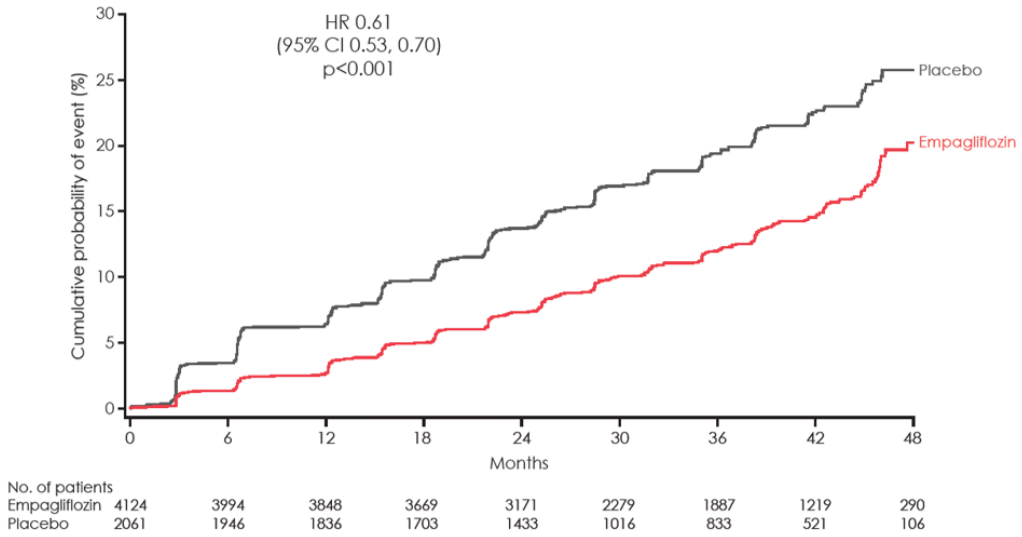
(Using three, four even five blood pressure medications in kidney failure patients are quite common)

The drug treatments should include those drugs which specifically protect the kidney and slow the onset of chronic kidney disease.

These drugs are known as ACE inhibitors, angiotensin receptor blockers (ARBs) and most recently SGLT2 inhibitors. It is these new SGLT2 medications that are dramatically altering the outcome for Kidney patients.

Below is the classic graph showing Kidney Disease can be effectively treated, in this case with the SGLT-2 Empagliflozin. There are similar graphs with Dapagliflozin, Semaglutide and Finerenone.

Incident or worsening nephropathy



Reducing Chronic Kidney failure Progression with an SGLT-2 (empagliflozin)

A **common** mix of medications in chronic kidney failure patients would be;

an ACE inhibitor (perindopril, known as Coversyl),

hydrochlorothiazide (a common diuretic),

metoprolol (a beta-blocker) and

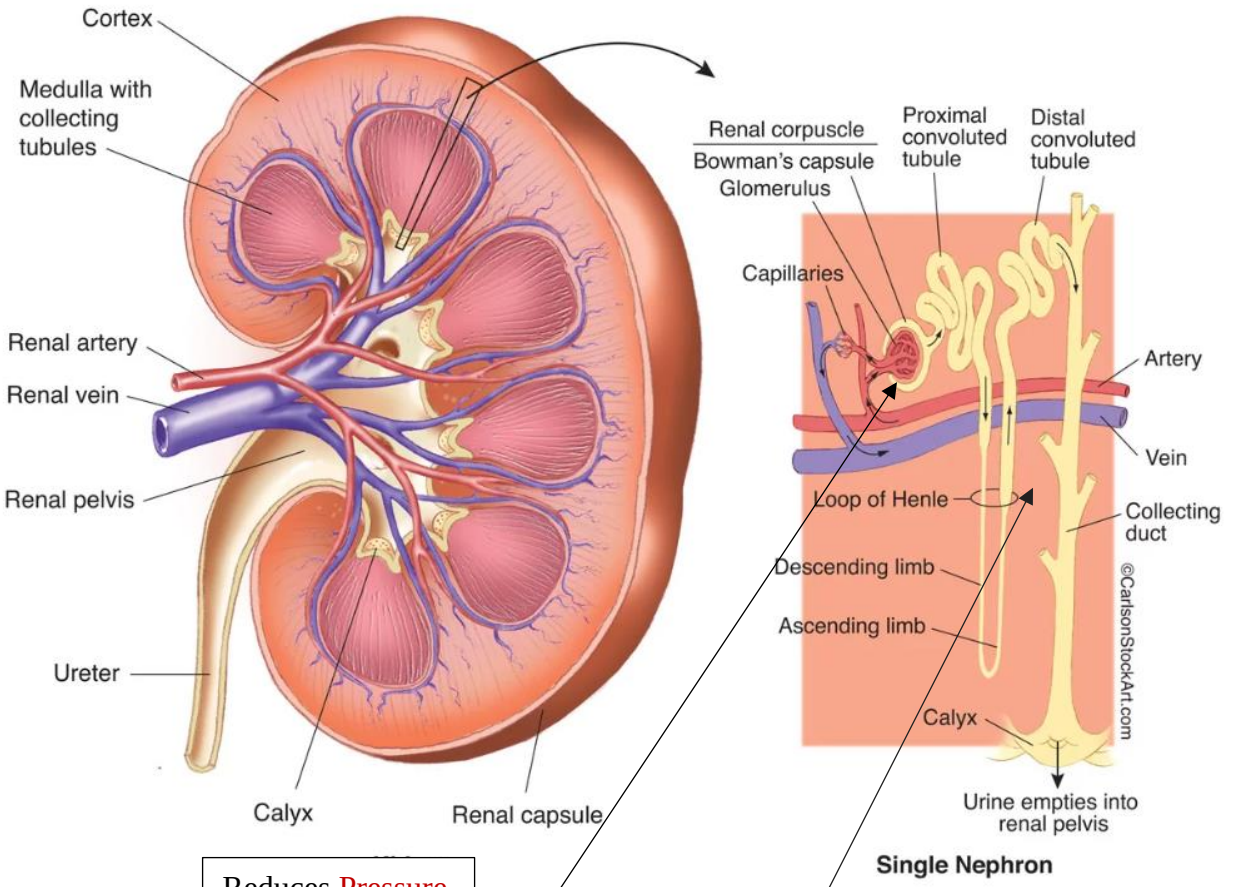
Dapagliflozin (an SGLT-2 inhibitor)

Semaglutide

Finerenone

Spirinolactone

By inhibiting mediators of blood pressure and some cellular functions, these "Golden Age" of renal medicine drugs slow the rate of kidney damage in two ways.



Reduces Pressure in Glomeruli (the Kidney filters)

1

Reduces energy consumption in the tubular system (Kidney powerhouse) 2

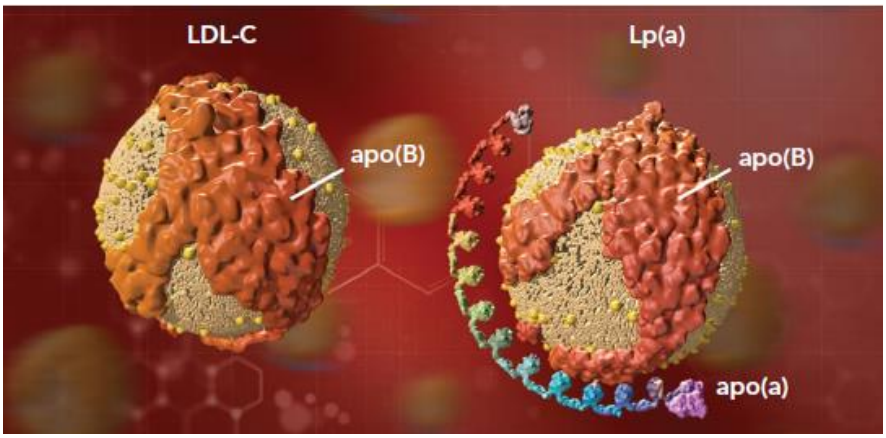
Treating LDL-Cholesterol and abnormal Sugar metabolism

Kidney failure **kills** not so much because of the kidney failure itself, but it accelerates general body ageing (by a factor of 5) and promotes heart attack and stroke.

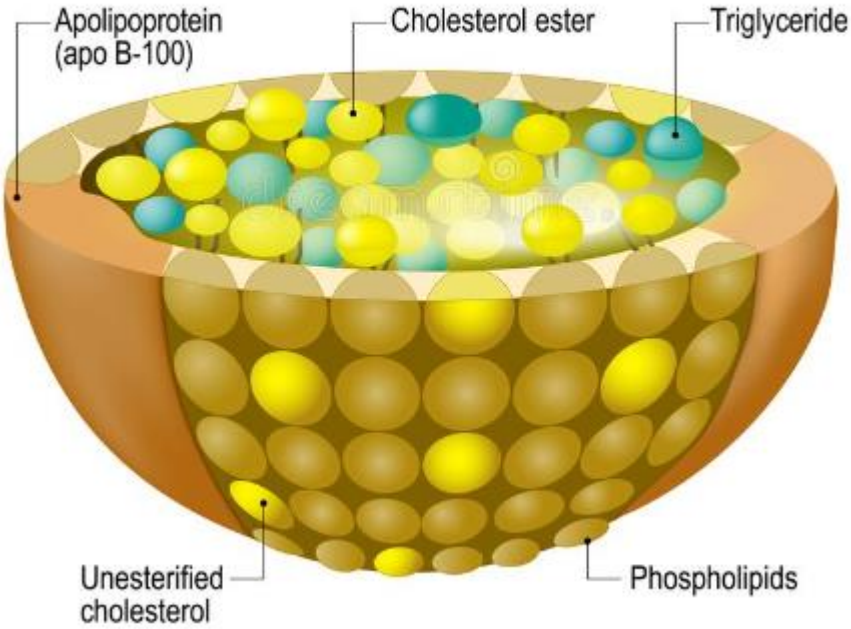
Treatment involves your metabolic condition, particularly **LDL cholesterol**, sugar, acid in the blood, abnormal potassium and other biochemical derangements.

The most important of these is tight control of **LDL cholesterol**.

LDL is known as your "Bad Cholesterol"; its function is to carry cholesterol and deliver it around the body. Cholesterol is very good for you; your hormones and membranes are made up of it. It's this combination making up the carrier particle LDL that is dangerous. Reducing LDL does not reduce the availability of cholesterol for your bodily needs.

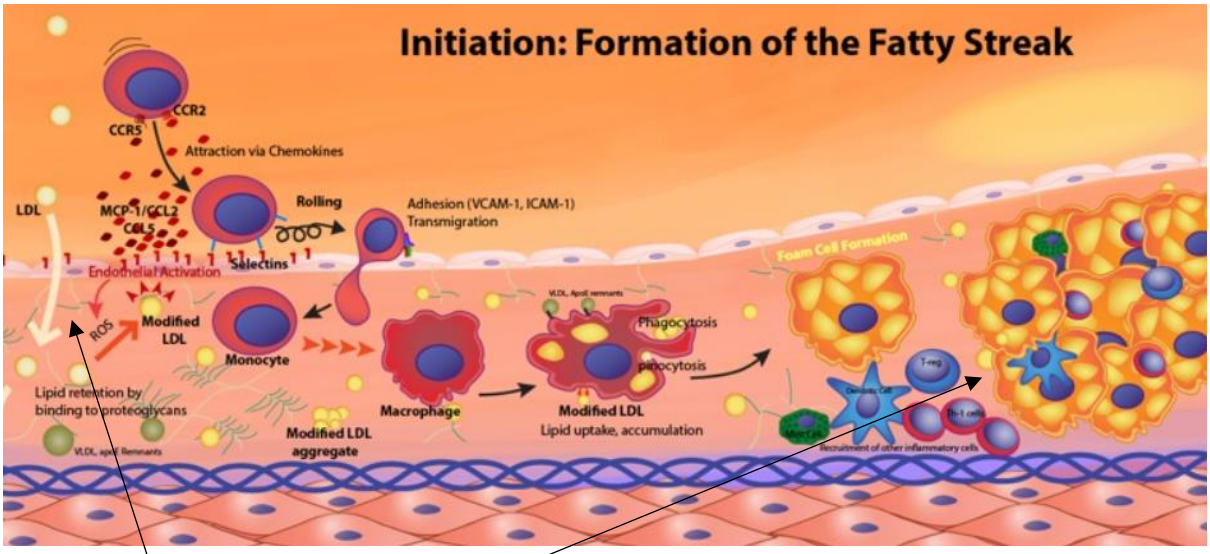


The combination of a raised LDL with an elevated Lipoprotein (a) level places you at **very high** cardiovascular risk for coronary artery disease and stroke.



LDL cholesterol particles of different size. The smallest and most oxidised are the most lethal.

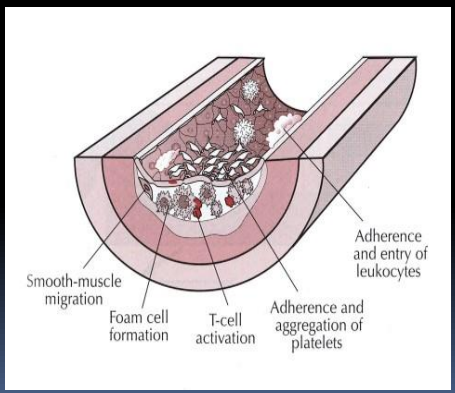
The evidence is it is a major cause of stroke and heart attack, is compelling!



LDL penetrates the endothelium and sets up an immunological process that results in an atherosclerotic plaque

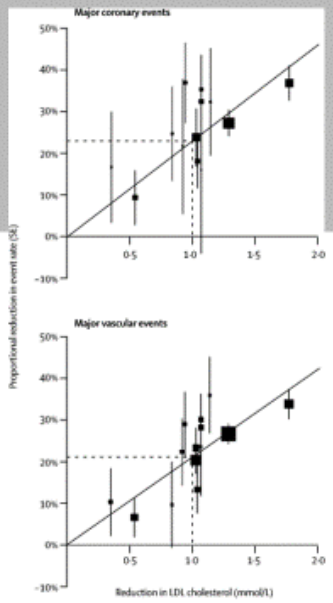
Atherosclerotic plaque

- **Lipid core**
- **Necrosis,**
- **Fibrous cap**
- **Occlusion**



LDL as a continuous variable

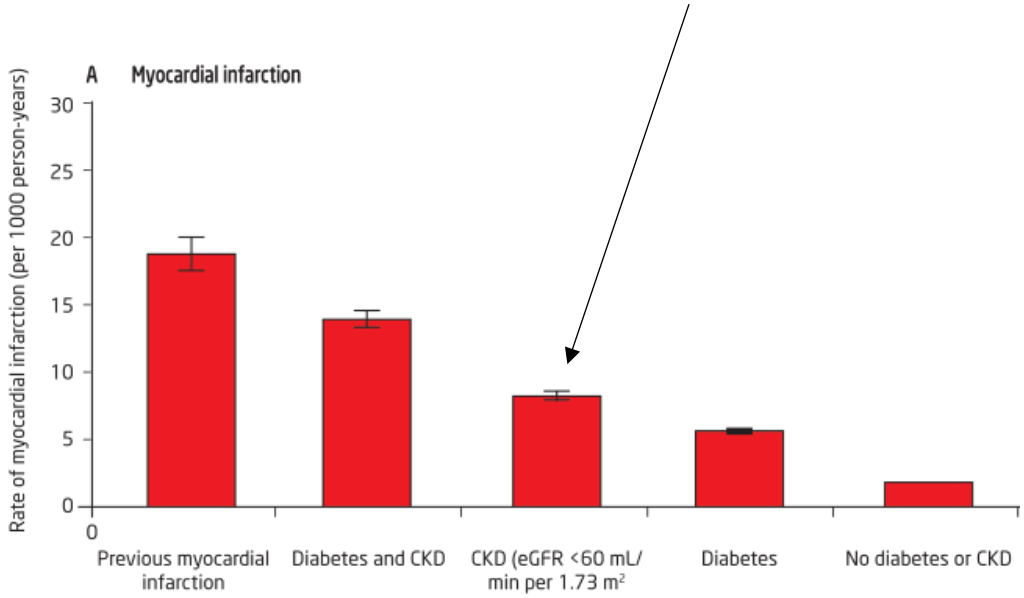
- Relation between proportional reduction in incidence of major coronary events and major vascular events and mean absolute LDL cholesterol reduction at 1 year



This meta-analysis reflects the epidemiology of LDL-cholesterol. The lower the LDL, the greater reduction of stroke and heart attack in the populations examined.

Kidney failure treatment should reduce **high cardiovascular risk**.

CKD, DIABETES AND CV RISK



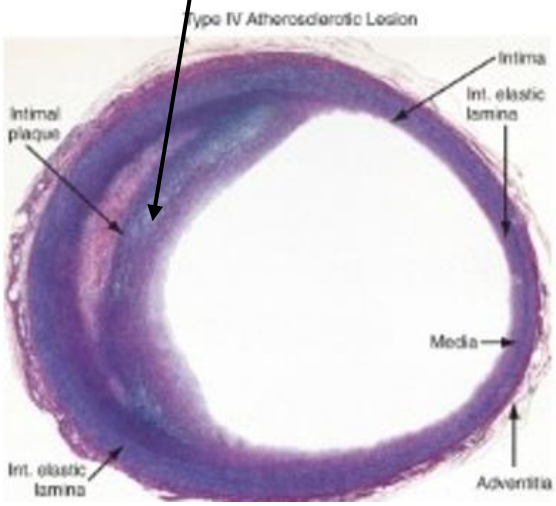
Adapted from Tonelli et al. 2012. [12]

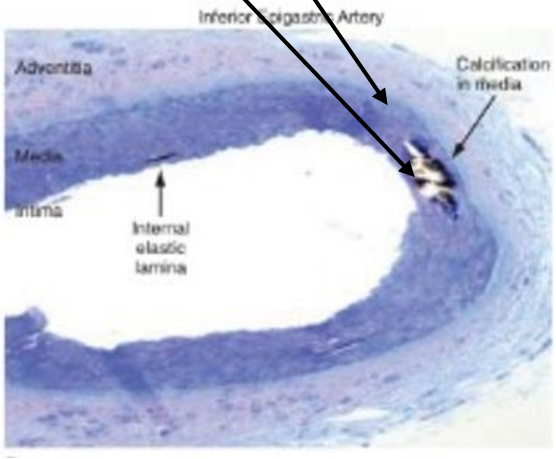
References: 12. Tonelli *et al. Lancet* 2012; DOI:10.1016/S0140-6736(12)60572-8.

The reason is that kidney failure accrues toxins, and blood vessel disease is worsened by three pathological processes.

Kidney failure patients die more frequently from heart attack and stroke because kidney failure accelerates blood vessel disease.

These are ***calcification, stiffening*** *and* ***atherosclerosis****, in the arterial wall.*





Best treatment is to reduce the LDL cholesterol below 2 mmol/l generally with statins (Atorvastatin is the preferred statin in kidney disease), but new medication (evolocumab) is emerging; treat metabolic derangements such as secondary hyperparathyroidism and acidosis, and use ACE inhibitors or angiotensin receptor blockers (ARBs) for their specific benefit on the very small blood vessel walls (arterioles).

Summary

Treatment of kidney disease is effective in reducing kidney deterioration and the cardiac and stroke consequences.

You must be under the care of a nephrologist to co-ordinate complex treatment!

Renal Diets, nostrums and "natural therapies" are generally not useful. (Many bold claims and hyperbole), but no solid evidence these reduce the rate of renal deterioration). Eat plentifully of all good foods and a protein/carbohydrate/fat balance.

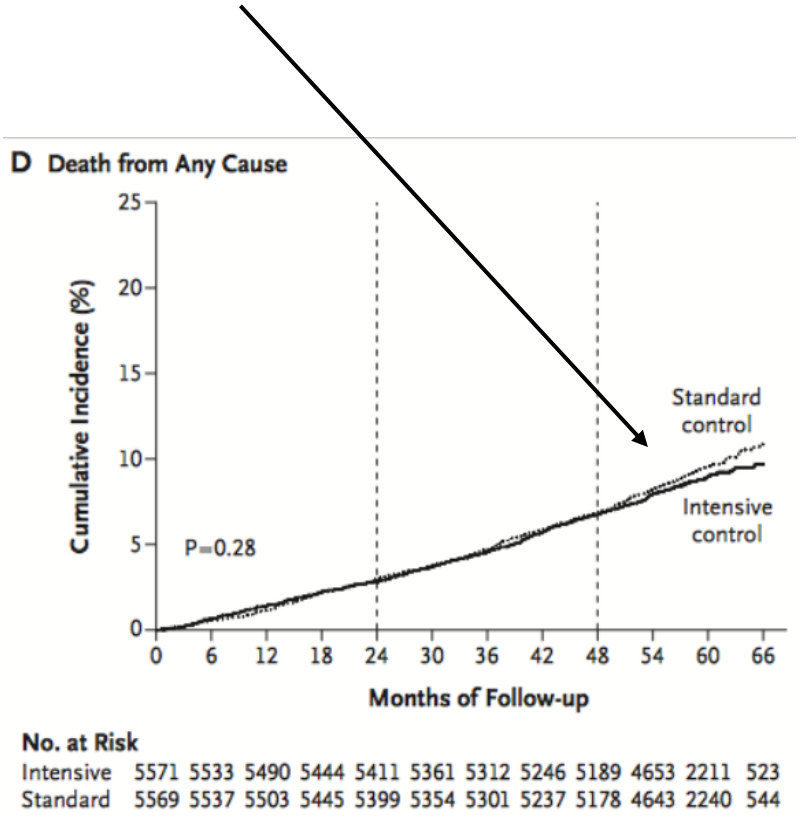
Hypertension control is critical, preferably including an ACE inhibitor (e.g., Coversyl)

Use of SGLT2 inhibitor (eg Dapagliflozin), GLIP-1 analogues (eg Semaglutide) and Finerenone medication reduces kidney deterioration.

Tight control of LDL cholesterol and sugar reduces heart attack and stroke.

The Kidney and Diabetes

23 years ago, scientific studies (random controlled trials) showed the available treatments of diabetes, but made little difference to the outcome, and no difference in preventing death from diabetes.

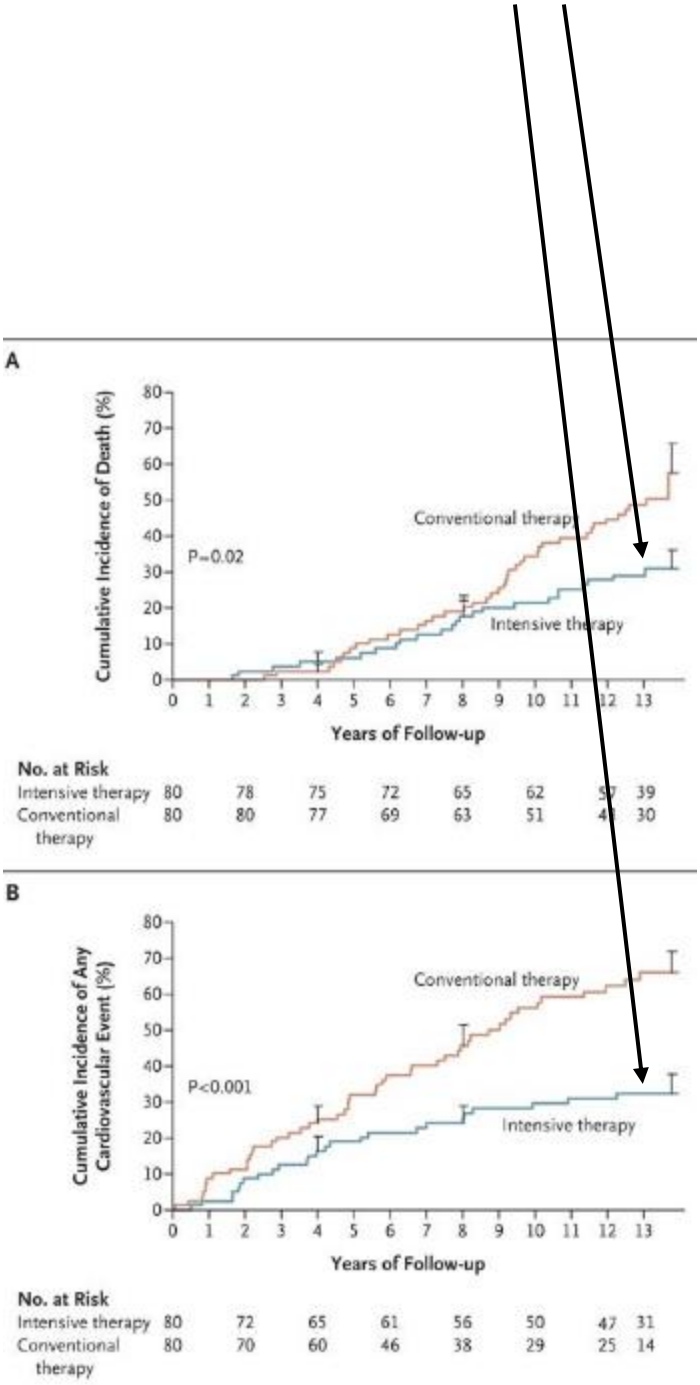


The diabetic rethink.

The major conceptual change was that diabetes was not a disease about blood sugar alone, but far, far, far, more importantly was a disease blocking off blood vessels, and treatment must be redirected to that problem.

The traditional therapies of insulin (e.g., Glargine Insulin) and Sulphonylurea medications (e.g., Gliclazide), although lowering blood sugar did very little to retard the progression of the disease and new therapies were required.

Results of **tightly** controlling LDL cholesterol and blood pressure, rather than focusing on blood sugar control as the only parameter, was very beneficial.



The contemporary treatment of diabetes is to focus on blood vessel disease which is the major cause of heart attack and stroke, and kidney failure in diabetes.

Blood sugar control is important, and in young patients a HbA1c of <7, but in older patients when a low glucose level could be dangerous, a HbA1c (especially in kidney patients) of<8.4.

Contemporary treatment has moved to SGLT2 inhibitors (for example Dapagliflozin known as Forxiga) and GLIP-1 agonists (for example Semaglutide)

Over the next few years these two classes of drugs will be much enhanced and multiplied.

Although these medications have been available for 10 years, they are currently much restricted by the Pharmaceutical Benefits Scheme. That is likely to change.

Contemporary diabetic treatments, how do they work?

GLIP-1 analogs in Diabetic kidney disease

"Intelligently" affect the pancreas to produce natural insulin proportional to the sugar that you've eaten. Thus, its use in type II diabetes. (Use in Type 1 Diabetes is commonplace but to reduce **weight** not blood sugar; and is off the PBS; i.e., you pay for it yourself.)

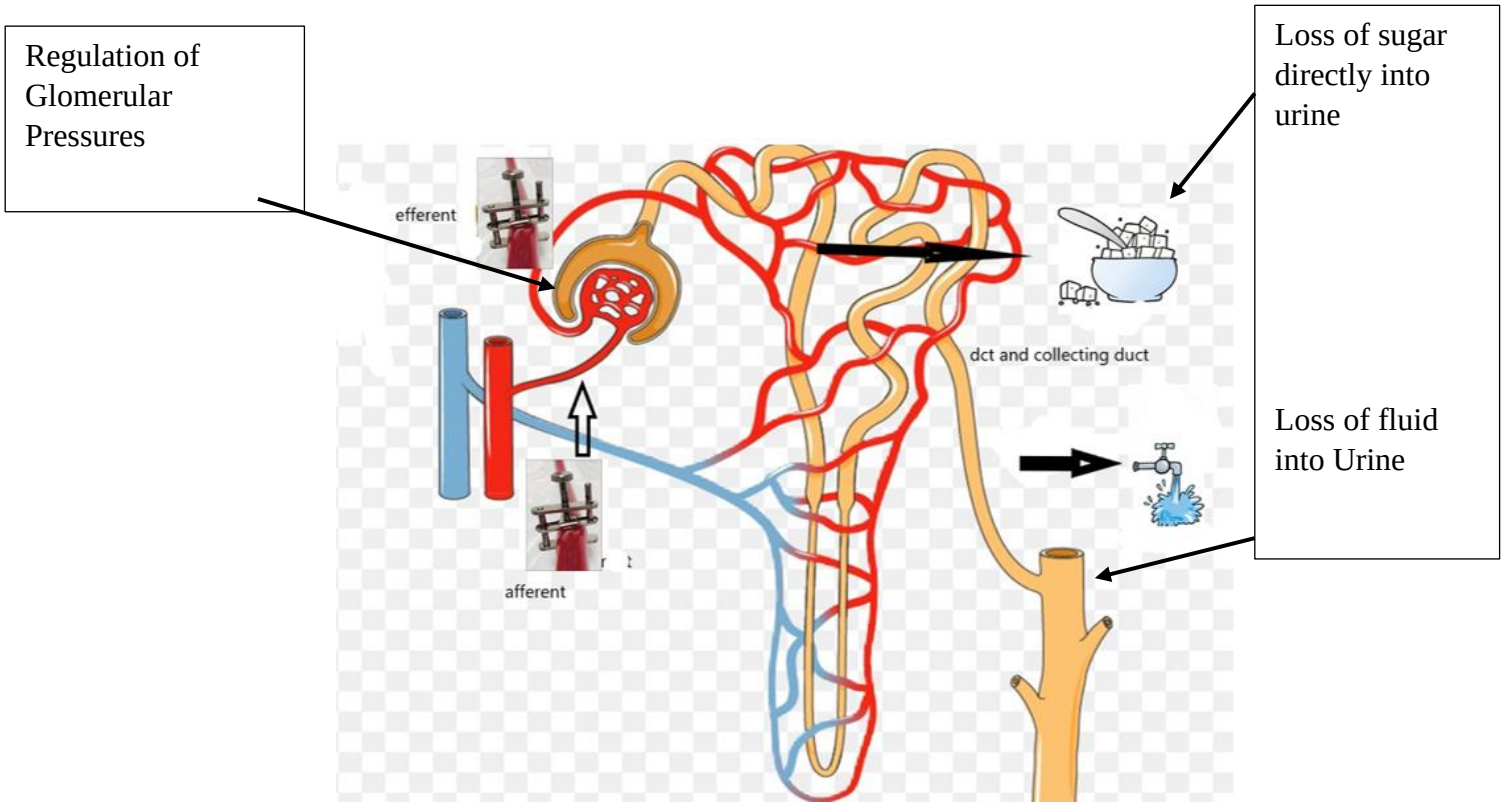
Reduces the **rate of passage** of food through your intestines, increases **satiety** (the feeling of not wanting to eat any more food after a meal), the net result is substantial weight loss, (thus its value in type I diabetes as well).

When treatment works, as it usually does, the weight loss can be up to 16% of your body weight. New medications shortly to come on the market (a combination of GLP and GLIP-1 analogues), promised to afford even greater weight loss and in some patients, the resolution of their diabetes.

Because dysmetabolism, obesity, fatty liver is **toxic to the kidney**, increasing blood pressure and reducing renal function and promoting excess protein in the urine, these

contemporary medications are preferred treatments for diabetic kidney disease. Reducing weight is a major contribution to Kidney health.

SGLT2 inhibitors in Diabetic kidney disease



Blood sugar Control

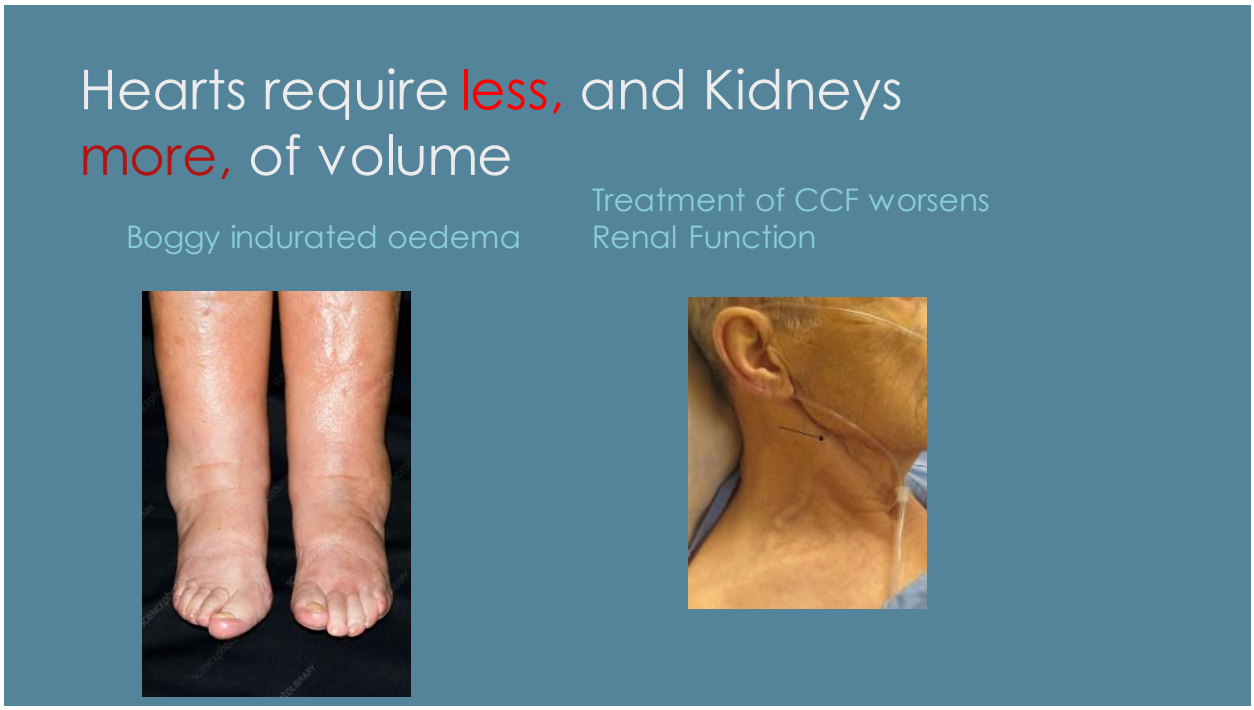
Blood Pressure Control

Kidney protection

Reduces Diabetic Kidney Disease

The Kidney and Heart Failure (Congestive Cardiac Failure)

The more strenuously treatment removes fluid, using diuretics and fluid restriction, and the lower the blood pressure, the more likely kidney function will deteriorate. It is with great craft, generally by reviewing the patient frequently, a **Kidney Physician** will strike the balance, or the sweet point, between treatment of cardiac failure for the best outcome, and optimal kidney function. It is a challenging task.



The contemporary treatment of heart failure, involves medications some of which are hostile to the kidney.

These are

Beta-blockers (for example Metoprolol all Bisoprolol, not adverse to kidney function)

Mineralocorticoid Receptor Antagonists (for example Aldactone, Eplerenone, Finerenone) may be adverse to kidney function because of the diuretic effect)

SGLT 2 inhibitors (for example Empagliflozin and Dapagliflozin, not adverse to kidney function)

Diuretics (for example Furosemide known as Lasix, may be adverse kidney function)

Valsartan/sacubitril known as Entresto which may be adverse to kidney function

ACE inhibitors (for example Ramipril, which may be adverse to the kidney when you are dehydrated)

These treatments may affect the kidney in two ways.

(1) Reduce the blood volume and Blood Pressure which feeds the kidney and allows it to function. This may be called a **prerenal effect**.

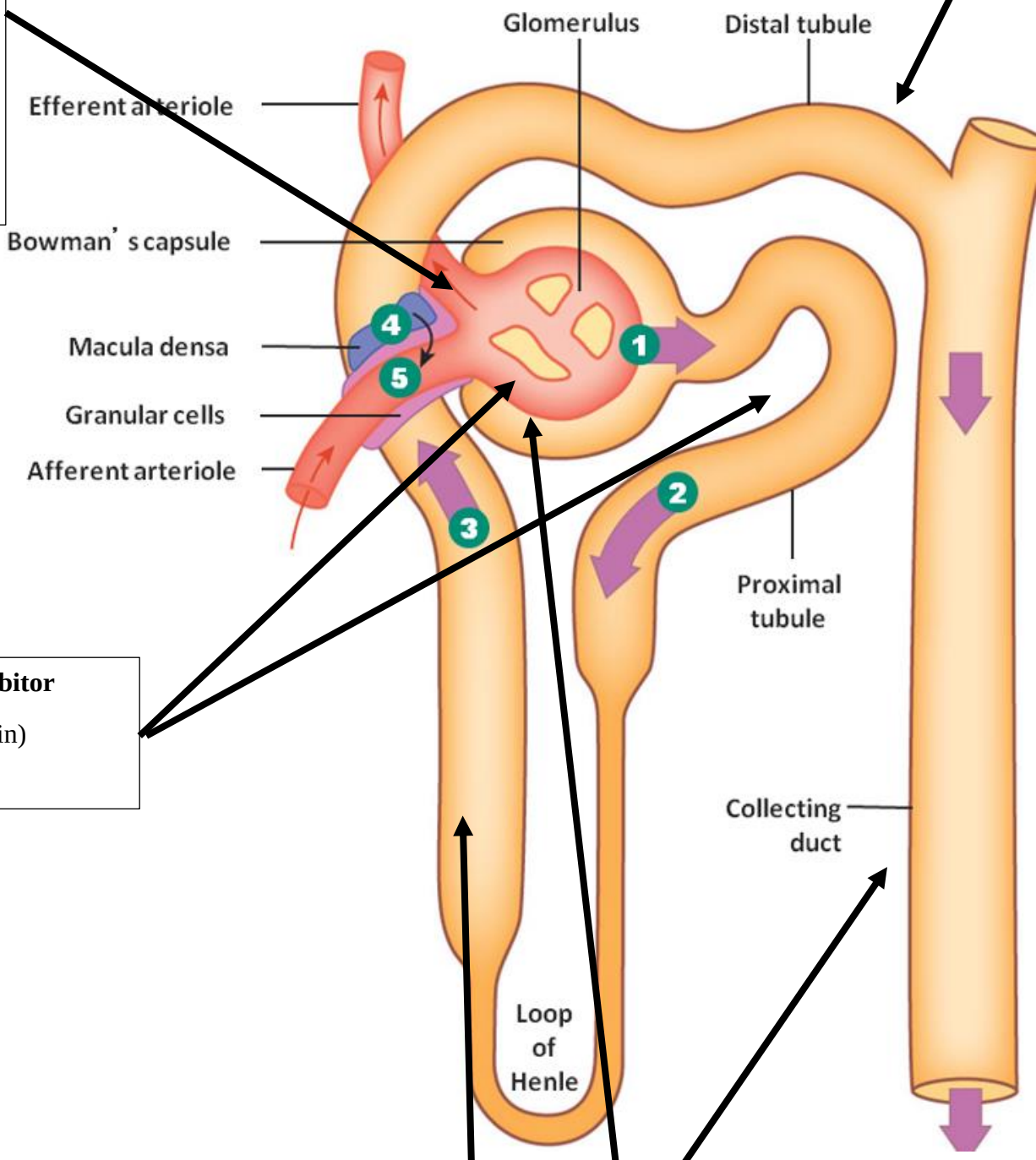
The kidney is starved of fluid but it is not necessarily damaged

(2) Set up the kidney in a precarious state susceptible to an **acute kidney injury**; that is acute failure of the function of the kidney. This may be life-threatening.

Cardiac Failure Drugs are massively beneficial compared to the past treatments, but managing these medications is very tricky.

Aldactone may dehydrate and increase blood potassium

Beta Blockers and **ACE inhibitors** may lower pressure to the kidneys and disrupt the "carburetor" of the kidney (known as autoregulation)



SGLT2 inhibitor

(Dapagliflozin)

Cardiac and Kidney failure requires great skill balancing powerful medications to find the sweet point where both kidney and heart function are optimal.

Lasix and Entresto may dehydrate

RENAL CYSTIC DISEASE

Sporadic (commonplace) Kidney cysts

These kidney cysts are common, and may be of any size

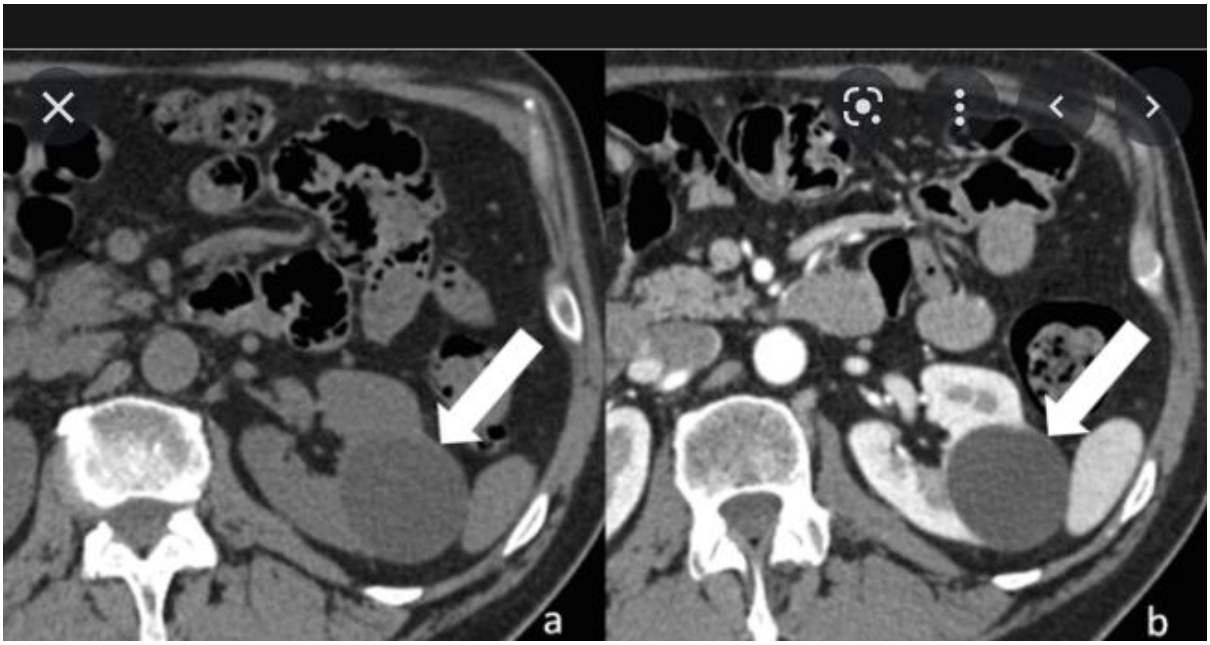
Sporadic cystic disease occurs in all age groups, more so in the older age group, and rarely cause a problem.

Degenerative renal cysts occur, seen almost exclusively in the older age group with senescent nephrosclerosis (aging of the kidney), and don't require treatment.

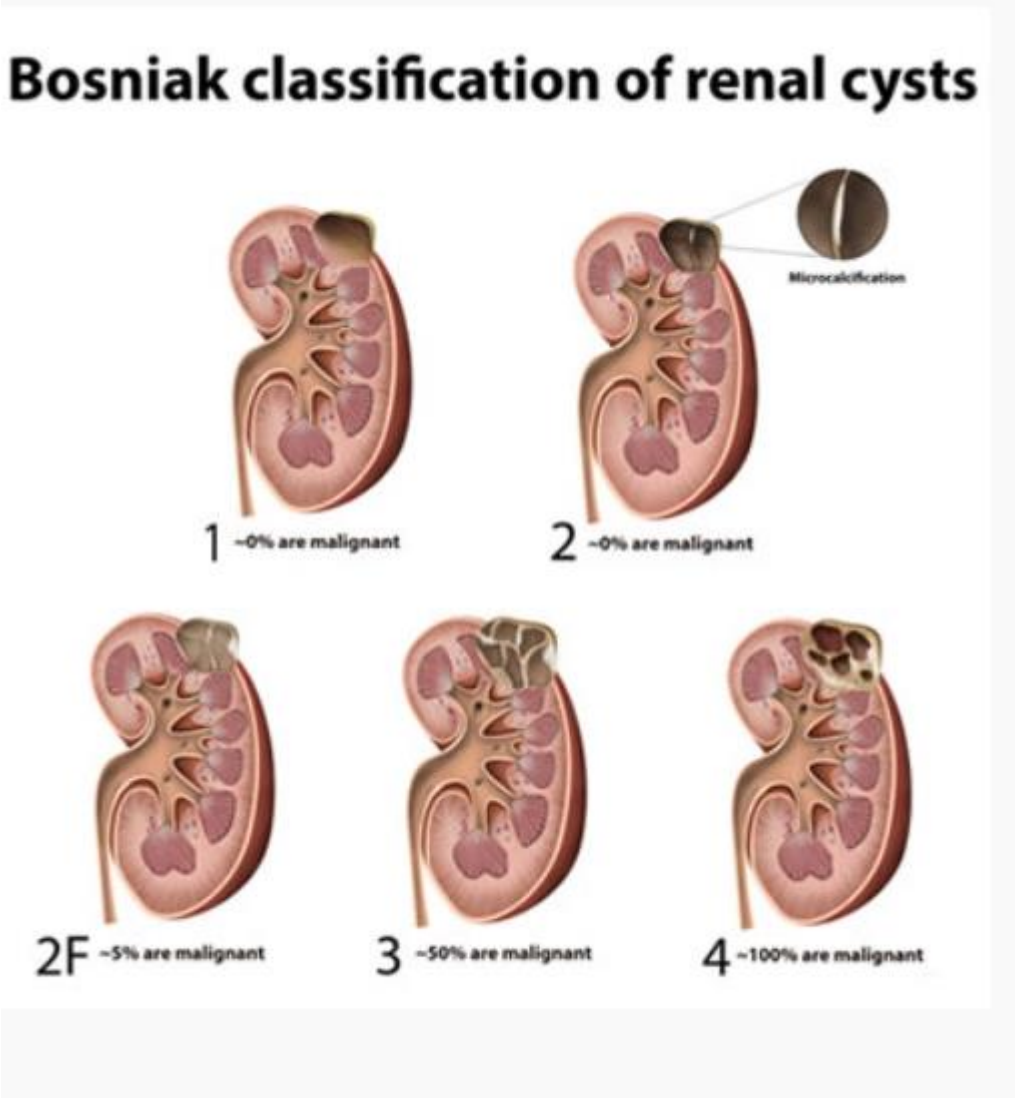
The Bosniak classification (see below) assists the Kidney Doctor deciding whether a cyst may be of a more serious nature.

That is not common, but every kidney cyst requires delineation, and follow-up with regular imaging if in any doubt. Remember, kidney imaging is cheap, and if done by ultrasound, harmless.

As a rule of thumb, ultrasound will define a cyst, but it is a screening test; a triple phase CT of the kidney is required for delineation. Follow-up generally is by kidney ultrasound.



Commonplace Sporadic Kidney cyst without and with contrast



Classification 2F, 3 and 4 require close follow-up by a kidney doctor.

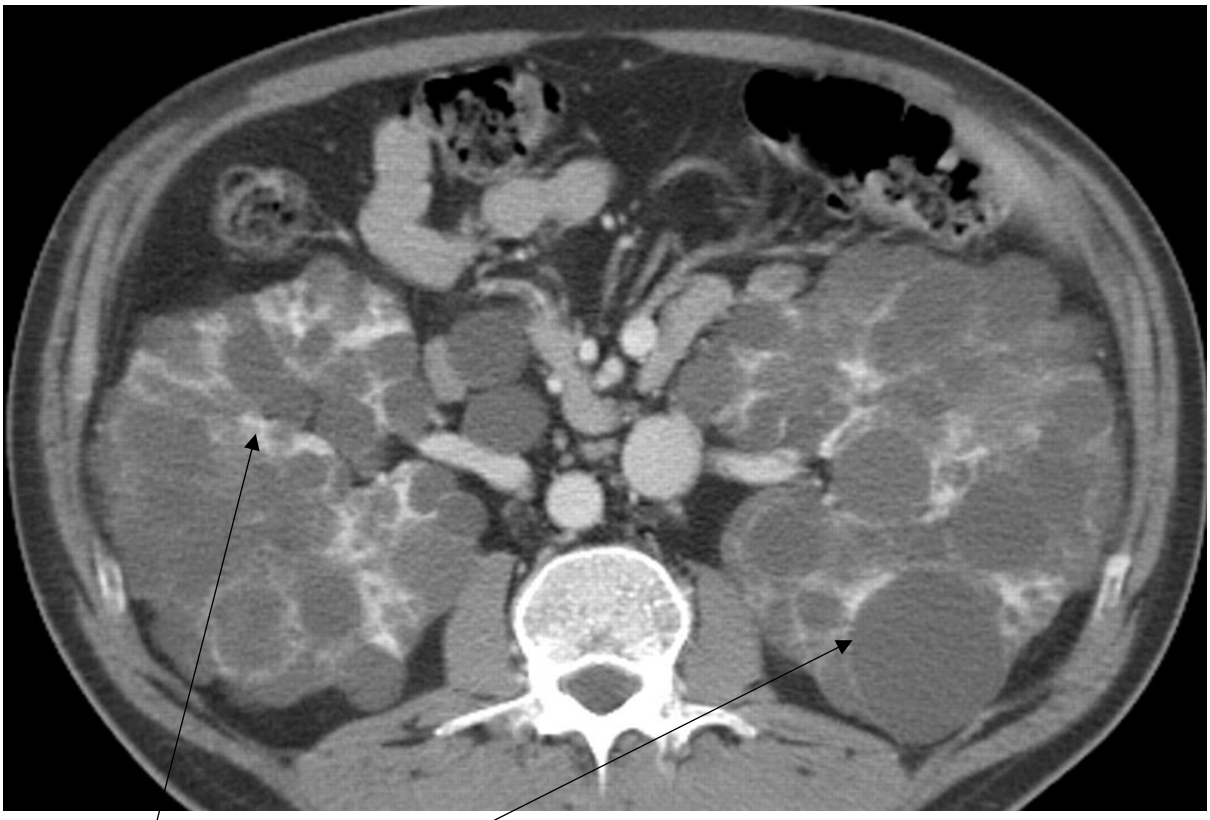
Never contemplate surgery to a benign kidney cyst unless absolutely necessary. Even very large cysts are best left alone. Unless they cause severe symptoms, they are not interfered with.

Indeed, decompressing a kidney cyst can be hazardous, and disrupt the adjusted blood flow in the kidney causing the kidney to wilt.

Adult Polycystic kidneys (aka PCK disease)

A common disease in kidney medicine.

The development of fluid filled cysts in the kidneys but often cystic development in liver and aneurysmal development in the arteries of the brain



Enlarged Kidneys and Multiple cysts

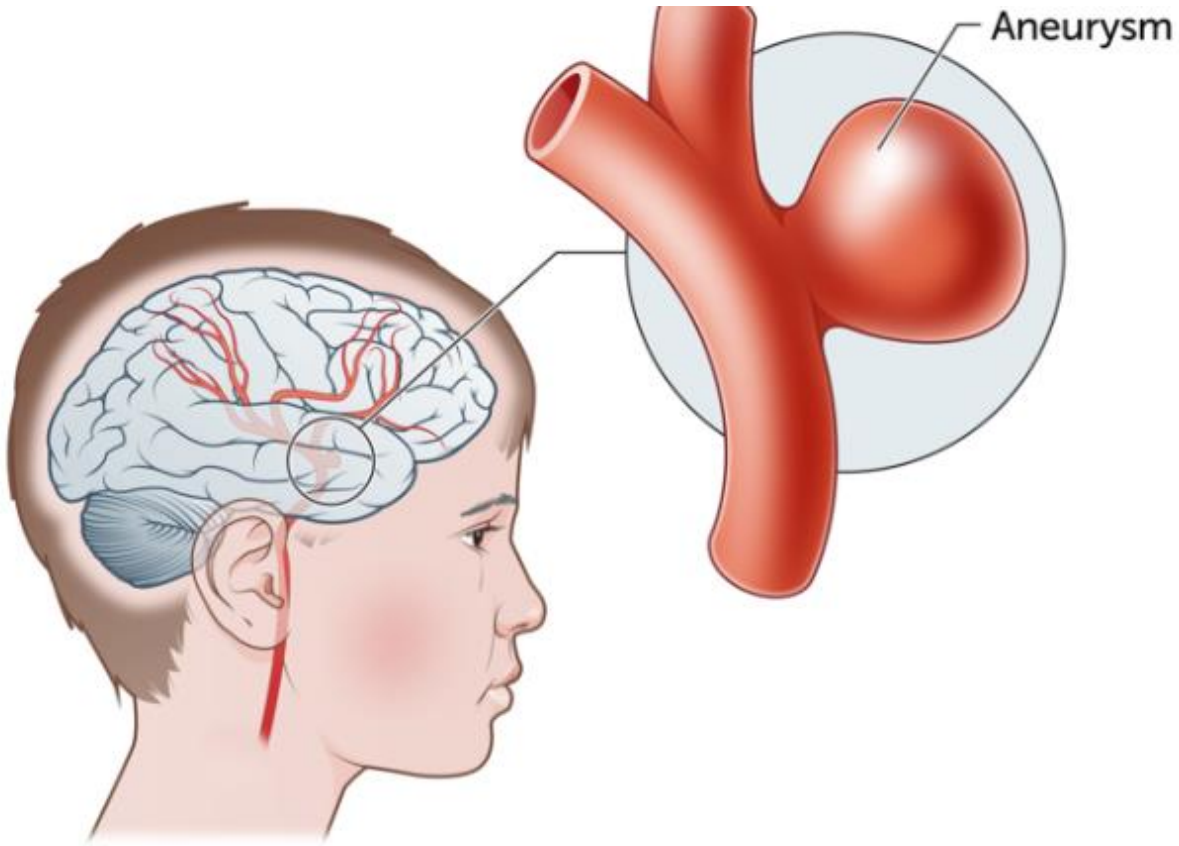
Multiple cysts crushing the kidney substance

The diagnosis is made by ultrasound, and later, by triple phase CT of kidneys and abdomen

Cysts can be in other parts of the body, particularly the liver.

Whereas the incidence of **cerebral aneurysm** in the normal population is 7%, in patients with polycystic kidney disease it is 14%.

That means an increased chance of hemorrhagic stroke.



Because of this, many Doctors do MRI examinations of the cerebral circulation every 5 years to detect whether there is the development of an aneurysm.

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The PCK disease can be associated with urine infections and hemorrhage into the cysts with red blood in the urine.

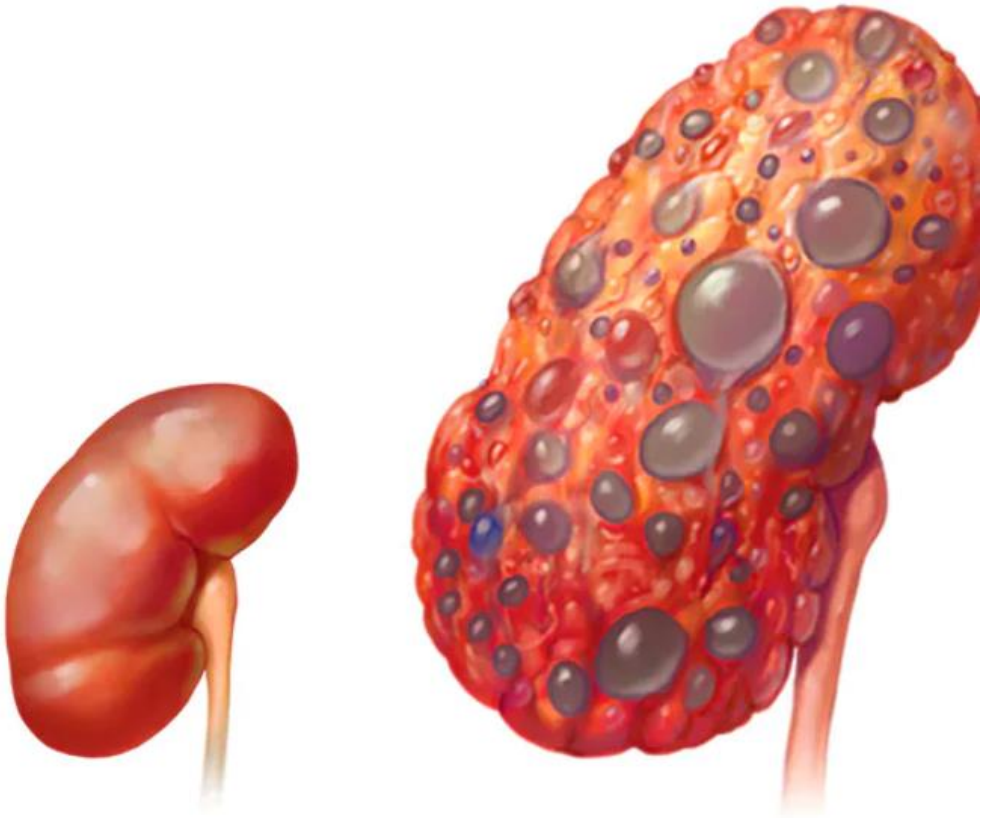
Most patients develop high blood pressure, and frequently complain of flank pain or back pain.

It’s inherited as an **Autosomal Dominant** condition; if you have the disease your children have a 1:2 chance of inheriting the gene and developing Adult Polycystic Kidney disease.

Nonetheless, PCK disease it is variable, some patients develop large kidneys, and others continue with small kidneys.

It’s the development of large kidneys with multiple cysts, which leads to kidney failure.

The cysts crush the internal structure of the kidney



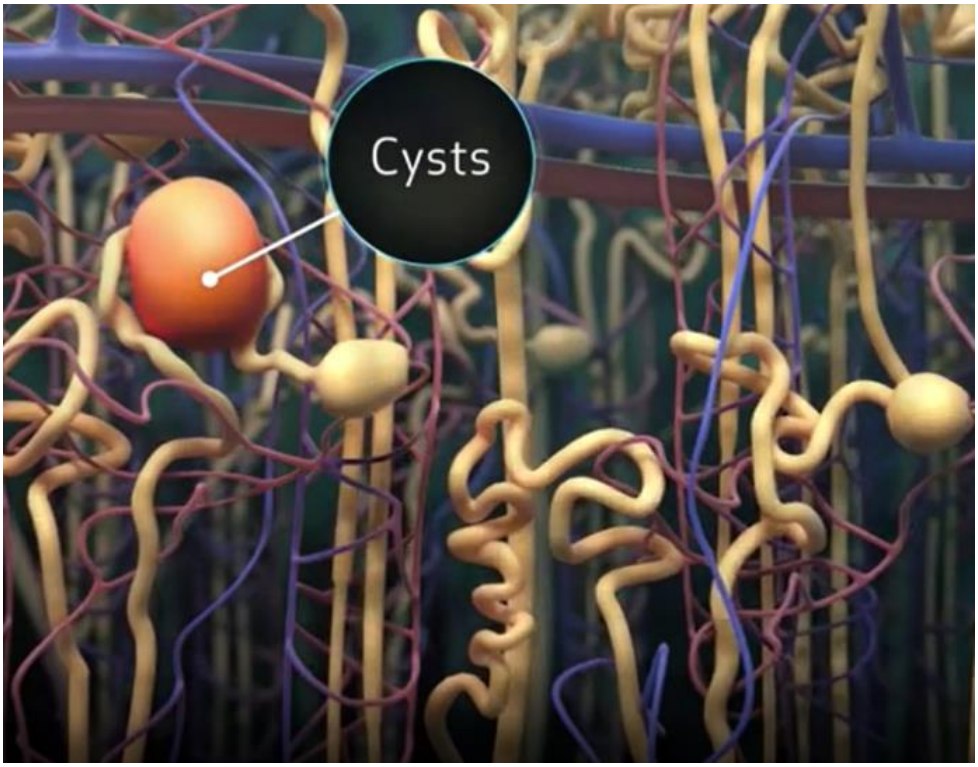
Normal kidney

Polycystic kidney

Just doing regular blood tests isn't enough. Cysts can develop markedly without any particular change in kidney function until late in the piece. That's why a Kidney Doctor must be involved.

Although it is a lifelong disease, deteriorating kidney function generally **presents after** the age of 40.

The cause of the cyst development and progression is being sorted, but effectively, the genetics give rise to a susceptibility of the internal structure of the kidney to **vasopressin**, a hormone from the posterior pituitary of the brain.



The combination effect is secretion of fluid into cysts which get larger crushing the kidney.

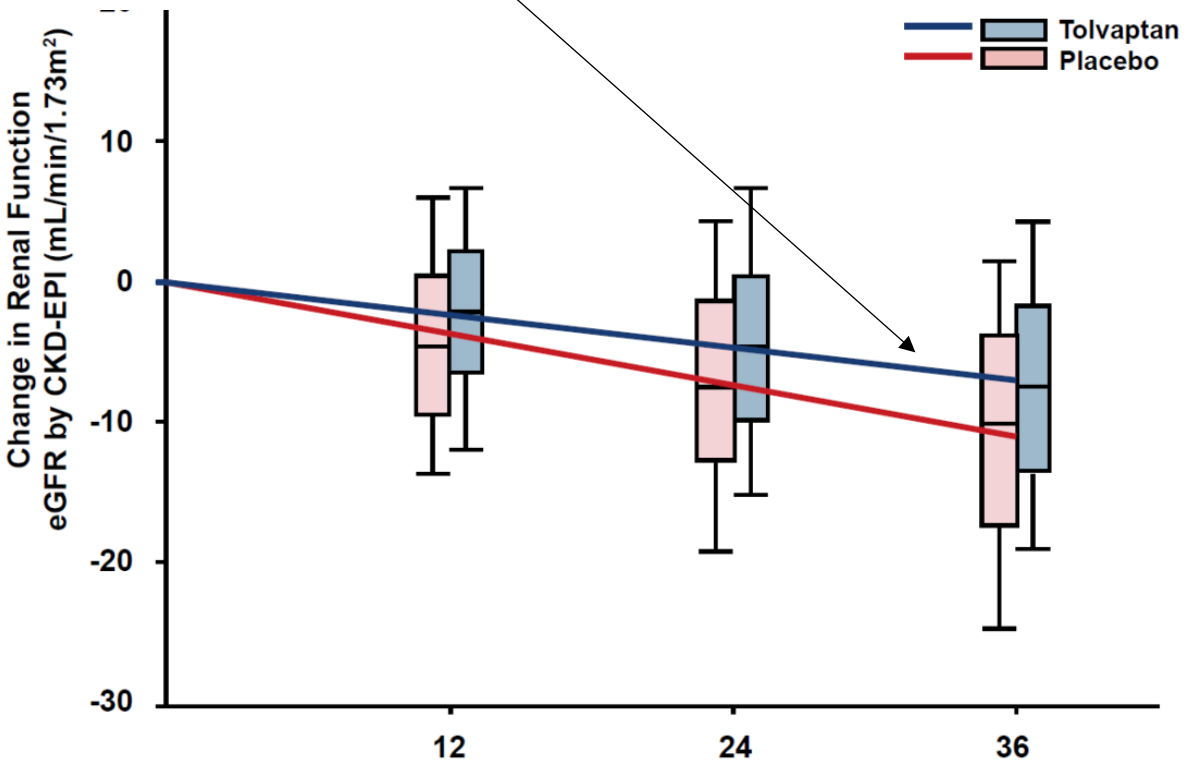
The micromolecular changes are mediated through cyclic AMP, but influential and a large portion of the problem is vasopressin from the brain. That allows treatment, using the drug Tolvaptan, inhibiting the vasopressin effect on cysts arising from the tubular system.

Treatment of polycystic kidney disease

Probably, the most important aspect is supervision by a Nephrologist.

Continuity of care over many years is important.

Because the enlargement of cysts is to a large extent driven by the hormone **vasopressin** from the brain, in associated with **cyclic AMP**, which is stimulated within the renal tubular cell, the use of Tolvaptan, a vasopressin receptor antagonist, has been shown to retard the progression of the development of kidney cysts, and therefore slows the decline of kidney function towards end stage kidney failure.



Reducing blood pressure adds to the slowing up of kidney failure.

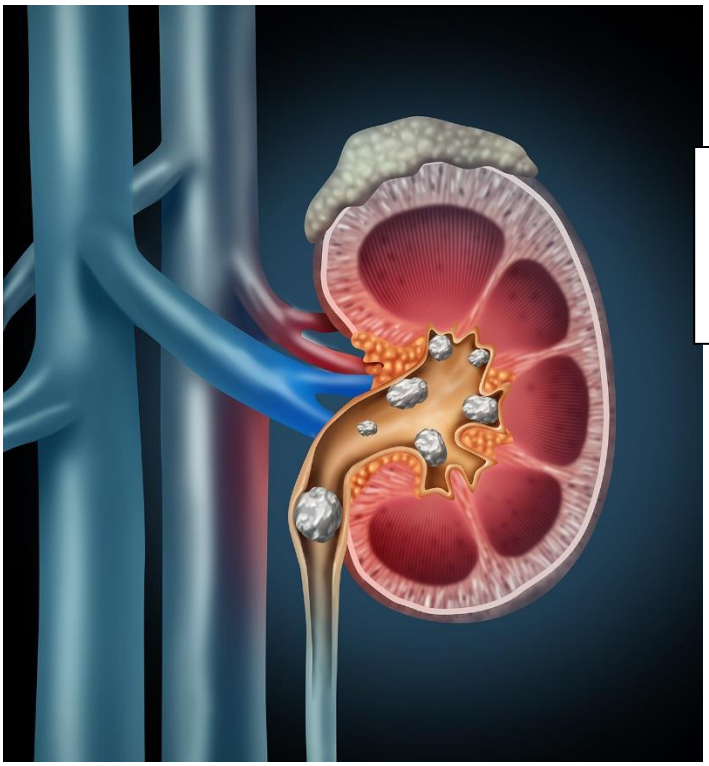
Treatment of hypertension, and the risk factors associated with kidney disease, for example LDL cholesterol and overweightness, is also important.

Eat good food. PCK diets (e.g., ketogenic diet), nostrums and natural therapies make big claims but no substantial evidence of a reduction in the deterioration of renal failure due to polycystic kidney disease.

The aim is to avoid dialysis or kidney transplantation if possible.

If not, then to face that prospect at a much later date in a patient's life, and importantly, rendering the patient in a healthy state by the time they require dialysis or kidney transplantation.

Kidney Stones



Kidney stone is a serious, often painful, medical, and often surgical problem.

They are common, patients mostly 30 years or older, roughly even sex distribution.

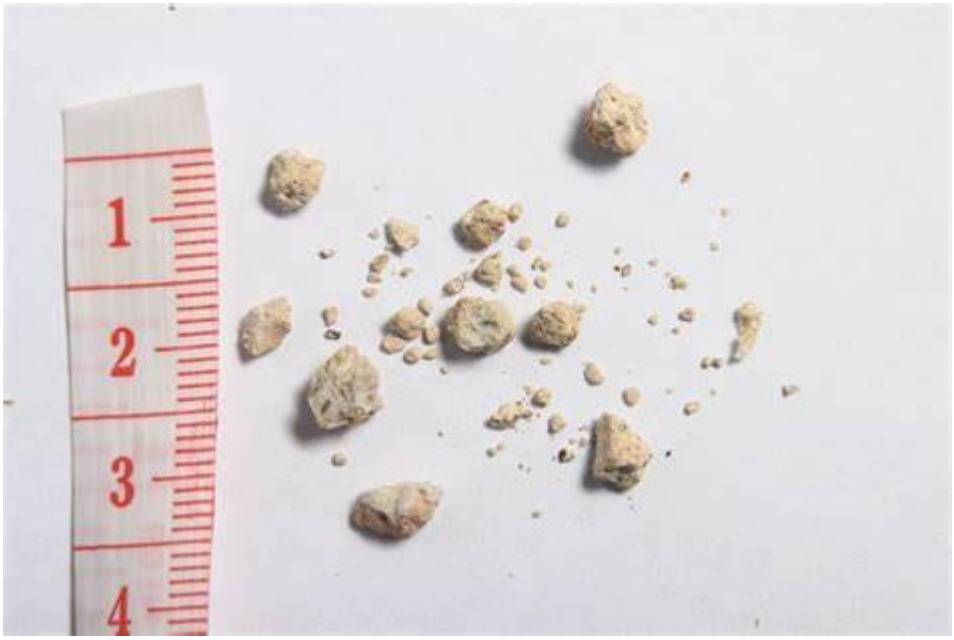
Kidney Stones is often underestimated; they may be dangerous!

GPs frequently refer to a Urologist. That is, to a Surgeon. *Stone medicine should be delt with by a close association between the Kidney Physician, and the Urologist or Kidney Surgeon. Both contributions are required to treat and prevent Kidney stone.*

Presentation can be --serendipitous, noted incidentally on an x-ray, or catastrophic, with a kidney stone jammed in either the kidney, the ureter or entering the bladder.

Frequently it is a medical emergency.

Kidney Stones aka Renal Calculi



Types

Calcium Oxalate stones 60%.

Calcium phosphate stones 10%.

Uric acid stones 17%.

Struvite or stones associated with urine infection 12%.

Cystine stones which are genetically driven, 2%.

Kidney Stone Formation

There is no comprehensive scientific explanation

There is a precipitation of chemicals which form a crystal, which aggregates.

One theory is that this occurs in the kidney tubular collecting system with a breach in the cell layer (urothelium) and a deposition of calcium phosphate. This called a Randall's plaque; With this nucleation, the stone begins to form.

An alternative theory (and probably more accepted) is nucleation for stone randomly commences with the precipitation of uric acid in the kidney medulla, about which calcium oxalate and phosphate aggregates.

Forming kidney stone at night in concentrated acid seems a likely scenario.

Those Patients at Higher Risk

Those with a family history of stone, diabetes or glucose intolerance, are juicing vegetables (and therefore a high oxalate intake), are chronically dehydrated, have a high protein diet (>150gms/day), and or a high sodium diet.

Also at risk are overweight patients and those who had gut operations (gastric bypass or complex lower gut surgery) or inflammatory bowel disease (ulcerative colitis or Crohn's disease).

Also, those patients who have chronic urine infection, particularly with abnormal kidney anatomy. Those ingesting excess calcium intake (milk-alkali syndrome of the 60's and 70's).

There are well defined but uncommon medical conditions that give rise to kidney stone, such as hyperparathyroidism (over activity of the parathyroid glands which are behind the thyroid), renal tubular acidosis and, and a genetic pre-disposition to cystinuria.

Management

Kidney stone should be managed by a Renal Physician, in conjunction with a Urologist.

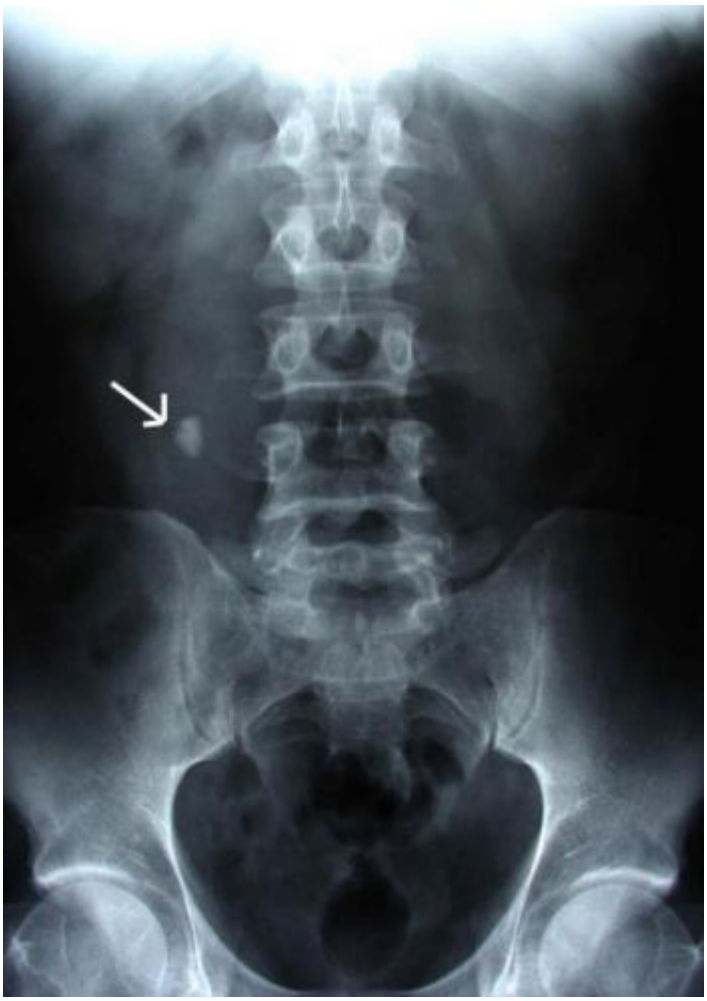
That generally doesn't happen; patients treated surgically for kidney stone, or where kidney stone has been detected by the General Practitioner, are not referred to the Renal Physician, and to their detriment. You may need to request a referral!

Imaging

Renal Ultrasound is a screening test (useful for cysts and kidney obstruction.

A plain CT of kidneys, urinary tract and bladder in the least imaging required.

Closer definition requires a triple phase CT or MRI of the renal tract



A triple phase Kidney CT for the initial investigation and definition of kidney stone.

Once defined and appropriate treatment in place, a plain CT KUB every two years is sufficient for monitoring.

Kidney stone patients require follow-up, otherwise treatment lapses with an 85% chance of a recurrence of kidney stone

The Renal Physician measures the urinary metabolites, (calcium, oxalate, phosphate, uric acid, and citrate), to determine the targeted therapy.

Therapies differ with the interpretation of the results.

The aim is to reduce a urinary metabolite to less than 50% of the “normal range”, and ensure plenty of citrate in the urine (an inhibitor of kidney stone), especially at night when stones are thought to form.

Useful treatments are allopurinol to reduce urinary uric acid (a medicine generally used for gout but not in this case), low-dose thiazide diuretic, vitamin B6 or pyridoxine, Urocit K (which affords potassium citrate at night, but the tablet has to be made up by a

compounding chemist), Ural (which affords sodium citrate at night, well known by women who suffered dysuria) and citrated water at night.

Citrated water is a wedge of a lemon squeezed into a tumbler of water as a bedside drink. It sounds so prosaic but has been used for generations to prevent kidney stone and works.

An SGLT-2 reduces the chance of kidney stone (especially CaPO4 stones) by 50%.

Treatment is efficacious. Just how much is not known, as it is difficult to do clinical studies on patients with kidney stones.

By general agreement, there is an 85% chance of reducing the incidence of kidney stone with appropriate treatment, and an 85% that stone will reoccur at some time with no treatment at all.

Diet

Stone preventative diets have been lauded by many but practically, have not been found to be useful.

When it is blindingly obvious a patient has an aberrant diet that is high in oxalate, uric acid, protein or salt, then modification has some utility. It is a rare occurrence.

Emphasising a good fluid throughput, that is more than 2 liters of fluid/day, and to use citrated water at night, is the most useful aspect of diet.

Leomoned (ie citrated) water inhibits Kidney Stone formation

DIALYSIS

Dialysis saves life; therefore, it should not be approached with an alarm and anxiety but with gratitude and hope.

The Yorke Dialysis Clinic at Deakin, ACT

How Does It Work?

Metabolism, the normal functioning of the body, produces waste products and excess fluid.

The kidneys remove the waste to enable the smooth running of the body and they control the fluid content in the body.

Additionally, kidneys have a **massive** role in most of the functions of the body such as control of blood pressure, haemoglobin, electrolytes, bone metabolism, and are interactive with all aspects of bodily function.

One way of imagining what the kidneys do, in the modern setting, is to see the kidneys as the central processing unit (CPU) of body physiology.

As the haemodialysis machine (dialysis) takes over the function of your kidneys, it removes waste and fluid from person’s blood.

Therefore, the medical skill of your Kidney Doctor (Nephrologist) manages the other functions of the kidneys. For example, the Kidney Doctor probably will prescribe Aranesp or Mircera, which are Erythropoietin Stimulating Agents that take over the kidneys function in maintaining haemoglobin.

Starting Dialysis

The Arteriovenous Fistula

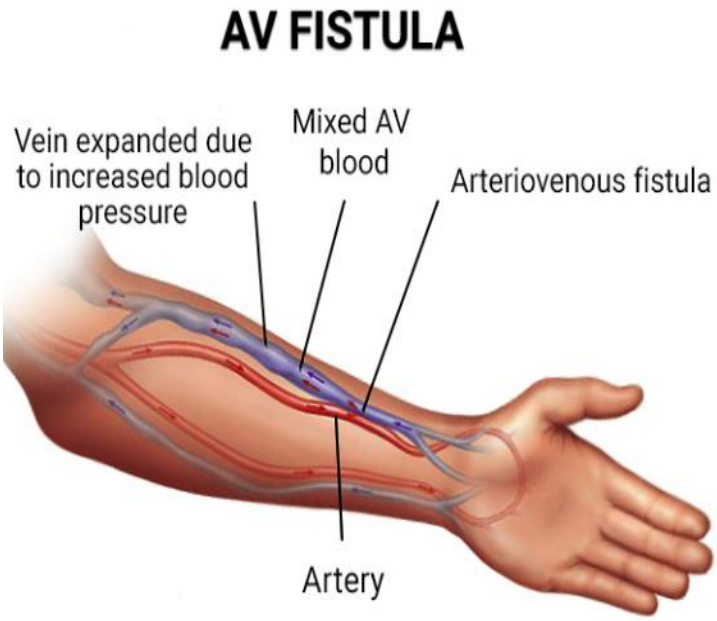
The first task, and this should be done at least three (3) months before haemodialysis is required, is the creation of a functional arteriovenous (AV) fistula.

This complex surgery, is performed by an expert Vascular Surgeon.

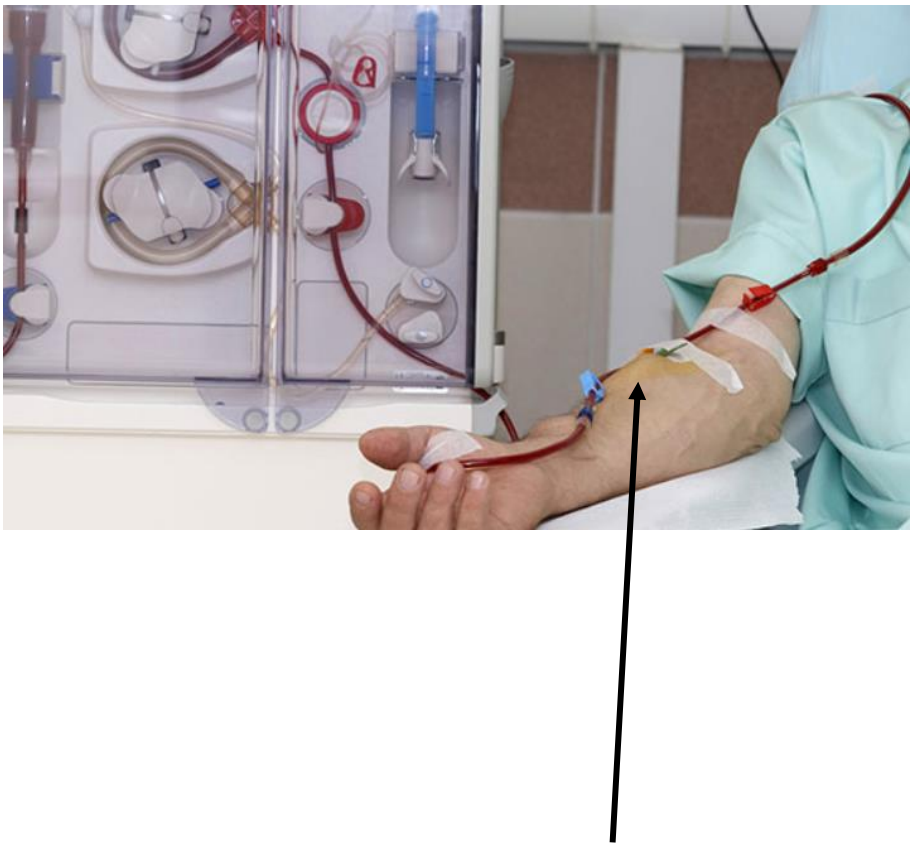
Because about 1/3 of these operations require additional surgery, continuous maintenance or even repeat surgery, timely placement of an AV fistula is essential.

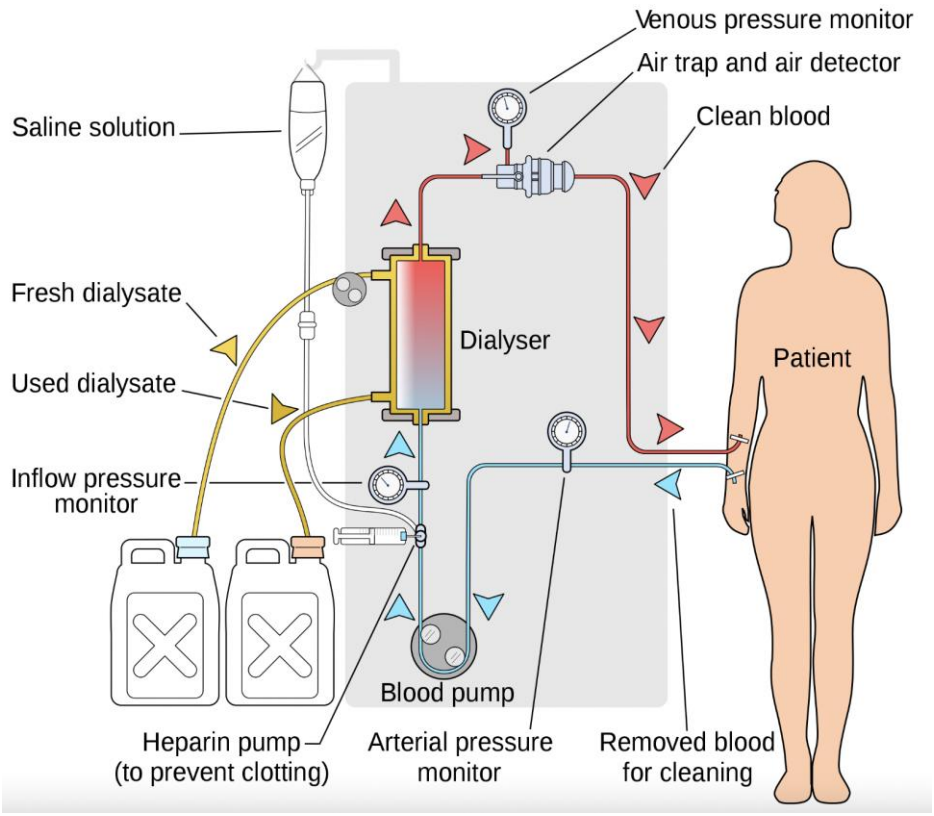
The AV fistula is usually placed in the arm; it may also be placed in the thigh.

The fistula is located beneath the skin to enable blood to flow directly from the arterial supply to the venous drainage, creating the desired high pressure and a flow in the veins of patient's arm. It is not obvious to a casual observer.



AV Fistula cannulated connecting the patient to the Dialysis Machine





Schematic of a Hemodialysis Circuit

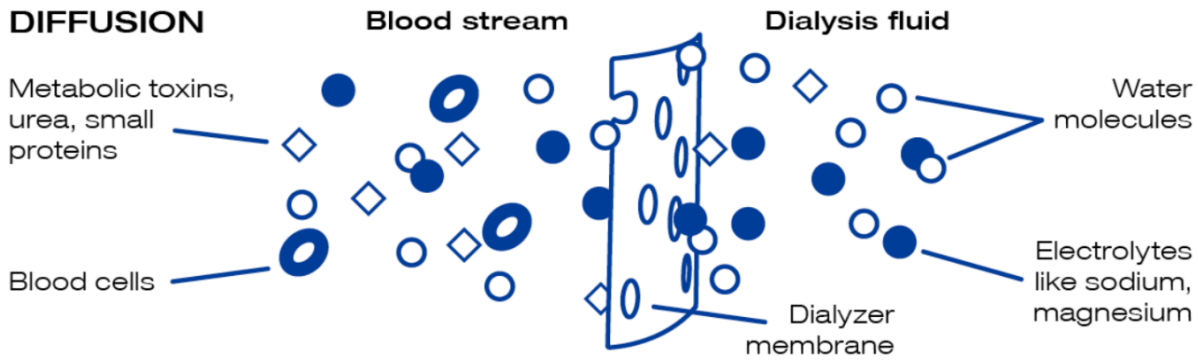
3

Action of Dialysis

Diffusion across a **semipermable membrane**

membranes in the **dialyser**

At the molecular level, the waste products diffuse down a concentration gradient across a semipermeable dialyzer membrane.



Diffusion

By adjusting the type of semipermeable membrane in the dialyser, and the pressure across the dialyser, various sorts of haemodialysis may occur.

In the dialysis unit you will learn about (**standard) Hemodialysis, and Hemodiafiltration**.

There is no advantage of one over the other with respect to how long you live, but some aspects of dialysis such as high blood pressure and fluid control, and a sense of well-being seem to favour hemodiafiltration.

BASIC TENETS FOR CHRONIC HAEMODIALYSIS TREATMENT

Dialysis is a process of **replacing** the natural kidney function with a machine that filters metabolic wastes, fluid, toxins, and salts from blood.

However, dialysis is an **imperfect** system that does **not** treat kidney disease.

The candidates for the dialysis **must be in a need** of the treatment, **understand** it and **wish** to have the treatment. They also need to be **capable** of participating in the treatment.

The ethical purpose of dialysis treatment is to maintain or improve, or at least prevent a diminishment in the **quality of life** of a patient with chronic kidney failure.

Dialysis requires complex medical and surgical interventions. Therefore, chronic dialysis for a purpose of preserving life only without providing quality of life, is futile and ethically unsustainable.

Approaching a Need for Dialysis

This generally occurs when the creatinine is greater than 300 umol/L.

Early and adequate preparation for dialysis affords a good result. No timely preparation, leads to unnecessary complications.

A Vascular Surgeon creates an AV fistula, either in the wrist, or in the upper arm.

This is complex specialised surgery and the fistula may take up to three (3) months to heel and be able to function.

It is recommended that a patient will regard the following in preparation for dialysis:

- Stay close under medical supervision.

1.

- Engage actively in gathering and understanding information, and plan for the future.

2.

- Interact with dialysis staff by visiting the dialysis unit for the purpose of familiarisation.

3.

- Check own private health insurance status to make sure eligibility for dialysis at the private haemodialysis unit (e.g., York Dialysis Unit), unless the patient is going to dialyse in the public system.

4.

- Discuss with your Kidney Doctor the question regarding which dialysis, haemodialysis or peritoneal, is most suitable.

How Much Dialysis Is Needed?

Dialysis is a prescription issued by the Kidney Doctor.

The dialysis prescription covers the specifications of the dialyser (i.e., the artificial kidney), such as the time you spend on dialysis, ultrafiltration or how much fluid would be removed, and the electrolyte concentrations of the dialysis fluid.

The dialysis prescription is mostly managed by the nursing staff of the dialysis unit.

Time On Dialysis

How much time is needed on dialysis? The dialysis prescription may be varied according to blood test parameters and the amount of fluid which must be removed with each dialysis.

However, the standard operating procedure in Australia is four (4) hours three (3) times a week.

The Medical Advice

“The more haemodialysis the better”. Extended dialysis or even daily dialysis is offered by some Units.

Dialysing less than 12 hours a week routinely is undesirable for the patient’s health.

Haemodialysis greater than 12 hours/week may make patient feel better, as fluid removal, electrolyte and phosphate removal are easier, but it doesn’t do much more than that.

It has been shown that extended weekly dialysis time does not prolong a patient’s life.

The standard dialysis prescription of 12 hours/week has been arrived at over 30 years because of the development of high-performance dialysers, affording free time for a good quality of life, optimal medical outcomes, and dovetailing into medical, nursing and hospital routines. Dialysis administrative concerns are always a major consideration!

Navigation

The important point is that although routine dialysis time should be 12 hours or more, within that routine prescription can be lots of variations that dovetail into the patient's lifestyle. It's a matter of negotiating these times.

If a patient is feeling well, capable of doing their daily tasks and aims, and the "figures" i.e., the routine blood tests look good, they probably are getting adequate dialysis and dialysis does not need to be increased on some biochemical measurement or performance formula.

It is often forgotten that most biochemical measurements are **surrogate markers** (for example **creatinine** comes from muscle, **urea** comes from liver, **uric acid** is a product of metabolism), not toxins but used as you would use a measuring tape measuring up a piece of wood.

It will be surprising to learn that not everyone who provides advice appreciates this point, but believe the biochemical indices do represent kidney toxins, which they don't. There are measurable kidney toxins, but those tests are not carried out routinely.

Is the Dialysis Prescription “Written in Stone”?

The dialysis prescription is not “written in stone”.

The amount of dialysis may be varied to suit patients’ needs. There’s considerable elasticity in dialysis treatment.

Missing the occasional dialysis to enable a long weekend, having more frequent dialysis, or having treatment twice weekly to facilitate a holiday is well within the compass of treatment.

Adjusting dialysis days to suit domestic or business arrangements and many other combinations is easy to accommodate and without adverse medical consequences.

The principle, is in the long term, there is adequate dialysis for your health and safety, but may be tailored to maintain or even improve your lifestyle or quality of life.

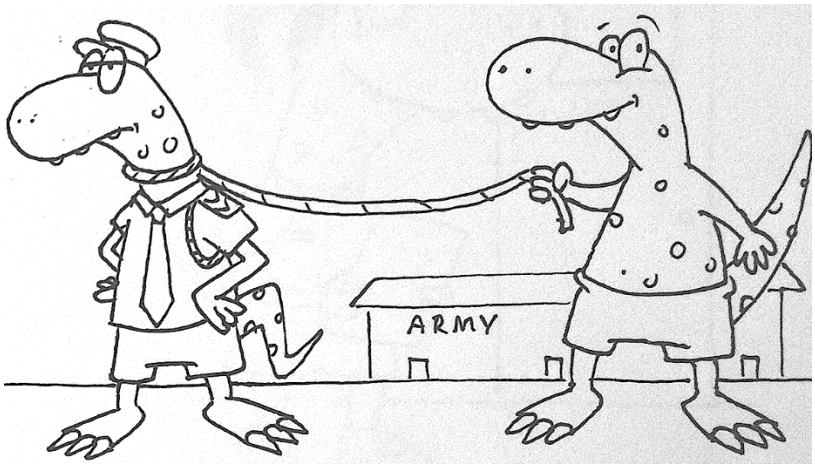
However, if efforts to maintain a healthy lifestyle and quality of life are neglected, all dialysis exercise becomes meaningless.

The Balance

A patient must seek the **balance** of maintaining and improving, but not allowing to diminish their quality of life, with the imposts of complying with the constant medical and surgical demands to do adequate dialysis.

The key is to understand the overarching concept of **maintaining autonomy** - the capacity to act in your own interests.

The patients should never allow dialysis to be their life, rather they need to direct it the way it is desired and allow dialysis to be an adjunct or means to that end.



It is challenging to strike the balance between maintaining the quality of patient's life, and the imposts of dialysis.

The dialysis treatment indiscriminately impacts upon patients from all walks of life, different cultures, expectations, habits, and philosophies.

This may seem inflexible, demanding, sometimes punitive and maybe bewildering, as it requires compliance if not obedience to repetitive and often painful treatments and procedures.

The System has scant concern for dialysis patients' quality of life, because it's impossible to measure personal needs.

The purpose of this section is to give understanding of haemodialysis and provide reference points to enable patients to maintain their autonomy and a better quality of life by proper navigation of the System.

ROUTINE BLOOD TESTS

Most Units routinely carry out the blood tests once a month.

Those blood tests examine patient's biochemistry, haemoglobin, iron stores and in particular the phosphate levels.

When the blood test results come back, there is the 'monthly inquisition'.

IMPORTANT:

It is in patient's interest to avoid the 'inquisition' and instead having constructive discussion with nursing and medical staff.

This is an intersection point which should not result in a punitive, stressful or guilt-ridden discussion, but rather conversation that provides opportunity to present and

discuss patient’s current status which naturally changes from month to month and from blood test to blood test.

Navigation

Patients should not feel embarrassed to ask the nurse in charge to provide a copy of the monthly blood tests for the purpose of an active personal involvement.

Patients should get reasonable understanding of some important blood results and in particular haemoglobin, creatinine and urea, potassium, calcium, iron, and phosphate**.**

The monthly pathology results should become patient’s best friend.

Haemoglobin (Hb) Is Too Low or Too High – Is It Really?

What is the blood test result?

The haemoglobin (Hb) should be maintained between 110 and 120 g/L.

With a Hb>120, there is a greater incidence of cardiovascular problems such as stroke and clotting of the fistula. Below a Hb of 110 g/L, patient suffers greater weakness, tiredness, and the fatigue of anaemia.

The Hb barriers are not set in stone. Going a little above or a little below doesn't matter, but generally the haemoglobin should stay within those limits.

Haemoglobin is usually maintained by the patient's Kidney Doctor prescribing an erythropoietin agent (Aranesp or Mircera) on dialysis. This medicine is administered by an injection into the dialysis system at the end of dialysis session every four (4) weeks (if prescribed by the Kidney Doctor). The least amount the better as larger or more frequent doses are associated with more side effects such as headache, body aches, diarrhoea, or vomiting.

Understanding Creatinine and Urea

Creatinine ("creat") and Urea measurements come up on the routine biochemical tests, scrutinised each month.

They are surrogate (i.e., in the place of) markers of the toxin levels in blood. They are not toxins in themselves!

These tests are best measured after the longest break off dialysis, generally on a Monday morning, taken before dialysis commences.

Typical pre-dialysis levels are a creatinine between 500-1000 umol/l, Urea 20-30 mmol/l.

Creatinine and Urea alone are not indicators of Dialysis adequacy; but if higher than expected, or excessively fluctuate, may point to a requirement for adjustment of treatment.

These tests are a quick way of viewing the system. (e.g., with a car, checking the idling revs)

Potassium Is High – Is It Really?

What is the potassium test result? What is the medical advice?

At a Copenhagen dialysis conference a few years ago, it was uncovered the nastiness of a high blood potassium.

The blood potassium levels should be less than 5.5 mmol/L prior to dialysis.

Higher potassium levels, to everyone's surprise, could cause sudden and unexpected death.

It has been well known for years that potassium level >6 mmol/L could produce paralysis and cardiac disease, but we were all surprised that we should keep it below 5.5 mmol/L.

Navigation. If potassium on the monthly bloods is >5.5 mmol/L, it should be clarified - why.

Generally, two pieces of fruit is part of a good diet; a marginal adjustment is required if consumption is more than this.

What isn't required, is to stop eating fruit and vegetables all together, or boiling vegetables.

Most patients manage on a "Good Food" common sense diet.
For those who have difficulty with potassium, their Kidney Doctor may prescribe Resonium to be taken on days between dialysis.

Resonium is a type of medicine which helps removing excessive potassium from the blood. It is not particularly appetising, but a scoop of 15 g on days between dialysis will control potassium.

This is particularly important during the stone fruit and grape season; rather than not enjoy the bounty of stone fruit in Spring, take Resonium.

The dialysis staff can repetitively measure the potassium on dialysis to make sure it is reduced.

It is almost never that patients have to abandon fruit or boil their vegetables.

Understanding Calcium

Check your monthly blood test results and if your calcium is abnormal, discuss with staff. The usual range is 2.10-2.55 mm/l for dialysis patients.

If too low, the hormone which regulates blood calcium will be excessively high, and “rot your bones”, known as (secondary) hyperparathyroidism. With age, diabetes, your genetic predisposition to osteoporosis, kidney bone disease or hyperparathyroidism can be a big problem.

If too high. Many of your body functions may be adversely affected (e.g., slow cognition, constipation, worsening pruritis), and your blood vessels may calcify up.

Treatment is a manipulation of the dialysis prescription (the calcium level in the dialysate) which the dialysis staff will sort, and use of calcitriol and/or cinacalcet, which is a job for your Kidney Doctor.

Do **NOT** take calcium supplements unless specifically instructed**.** (a rare occurrence)

Iron Level Are Low – Is It Really?

What is the iron test result?

If a patient doesn't have enough iron in body, the Kidney Doctor may prescribe iron supplements which is usually administered as an intravenous (IV) infusion at the end of dialysis session.

Iron supplements help the bone marrow make healthy red blood cells.

The Renal Unit has a protocol to maintain patient's iron stores.

Iron is normally used up during dialysis and more so with the use of an erythropoietin agent, Aranesp or Mircera.

Phosphate Is High? – Is It Really?

What is the phosphate test result?

Serum phosphate pre-dialysis levels between 1.3 and 1.8 mmol/L are adequate.

To do better than that will have an impact on a patient's quality of life because it would require an abnormal and somewhat family unfriendly diet.

Phosphate Binders Must Be Increased. Do They Really?

What is the medical advice?

A raised phosphate level in blood (hyperphosphatemia) is a common complication in haemodialysis patients.

That is because it is more difficult to remove phosphate during routine dialysis.

Hyperphosphatemia is an independent risk factor for cardiovascular disease and mortality on dialysis.

Navigation

In most cases, chewing your phosphate binder (Renagel or Fosrenol) with breakfast and dinner is adequate.

Most patients won't tolerate binders more than twice per day and although medical staff frequently increase the number of binders to extraordinary numbers, patients rarely comply.

If there is difficulty with phosphate, (level greater than 1.8 mmol/L on most occasions) it generally means a revision of your diet, but probably not in the way you think or have been advised (see Good Diet on Dialysis).

GOOD DIET ON DIALYSIS

Just being told that a patient's diet is bad, and in need of restriction of many foods, is unhelpful and will seriously impact lifestyle.

It is hard to be part of family if everyone has to adjust dietary requirements to cater for a patient's dialysis needs. In almost all instances, serious dietary restriction is unnecessary except for restricting an excessive use of salt (substituted by herbs) and sugar (substituted by spices).

Phosphate gets into blood stream as inorganic phosphate mostly in **preserved foods**, such as ham, bacon, chocolate, excess milk, and hard cheeses. Reducing, or even removing, those foods from the diet will overcome the undesirable levels of phosphate. Natural, non-processed food is not a problem.

Good food is fresh food, and a balanced diet is recommended. The focus is on the word "good".

Good food is the **mainstay** of a patient's quality of life. Prescription of harsh diets that render patient alien in their own home is not recommended. Turning the kitchen into

a chemical laboratory must be avoided! Boiling vegetables to remove potassium is not required.

Vegetarian diets may also be adequate. Such a diet may require a protein supplement. Watch your monthly blood results. Keep the serum albumen at or above 35 g/l (see below, Serum Albumen). Make sure your Kidney Doctor knows about the diet.

It is recommended that diet is adjusted based on the monthly results of blood tests. There is no urgency in achieving desirable results at first try. It is best to watch the blood test results and discuss them with nursing and medical staff who may provide advice on any adjustment to diet, if necessary.

Most patients achieve an excellent and nutritious diet consistent with family life with minimal adjustments but taking some phosphate binders.

Serum albumen is reflecting the protein intake and must be maintained. Consuming a good (frequently high) protein intake, such as red meat, is essential. Fabric decay (rapid ageing), worsening morbidities (co-existing diseases) and death relate to a low serum albumen.

On dialysis it is often easy to become unnoticeably malnourished.

Serum albumen is related to an adequate consumption of protein. The blood test will show that the higher the protein intake there will be proportionally a higher albumen,

and consequently Phosphate will be marginally elevated. But phosphate is easy to manage. Having good fabric with an adequate proteinaceous diet affords a better life!

Navigation

If patient is on several different medications, the taste buds may be affected. Taste sensation could be distorted and meals, normally very tasty and attractive to eat, become unpalatable. This could be overcome by adding herbs and spices to meals.

Is Dialysis Inadequate? - Is It Really?

Assessment of dialysis adequacy is fraught.

Staff frequently use a dialysis derived formula, Kt/V, and would seek to maintain the
result >1.4.

Kt/V is a measure of dialysis adequacy, where K is the ratio of urea clearance, multiplied by dialysis time (t), to the volume of water in your body.

The formula is not the only way to assess dialysis adequacy, by far.

It is an easy “Key Performance Indicator”, and that is probably why it has survived the criticism of its utility over the many years.

Dialysis adequacy should also be assessed with respect to patient’s general health, overall wellbeing, day to day activity, and capacity to achieve life’s aims as well as biochemistry.

REMEMBER:

Beware adjusting dialysis times simply on a formula or blood tests as it could easily make an impact upon patient's quality of life for no good end result.

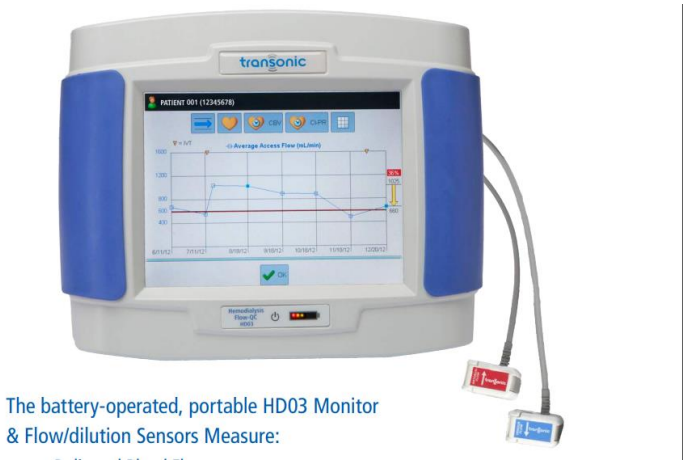
Any intended change to dialysis times must be always discussed critically.

TROUBLE SHOOTING DIALYSIS

Dialysis is always with medical and surgical toil. It is a manageable but imperfect system of treatment. Close co-operation and communication between patient, dialysis staff and regular (2-3 monthly) medical review by the Kidney Doctor, pre-empts problems, affords timeliness in treatment and a smooth operation!

Fistula Maintenance

The adequacy of the blood flows in patient's fistula is regularly assessed using the Transonic device.



Transonic Device

The apparatus is connected on dialysis to the arterial and venous lines.

This generally is a matter for the nursing staff.

The nursing staff will cannulate patient, and will be vigilant with respect to the maintenance and performance of the fistula.

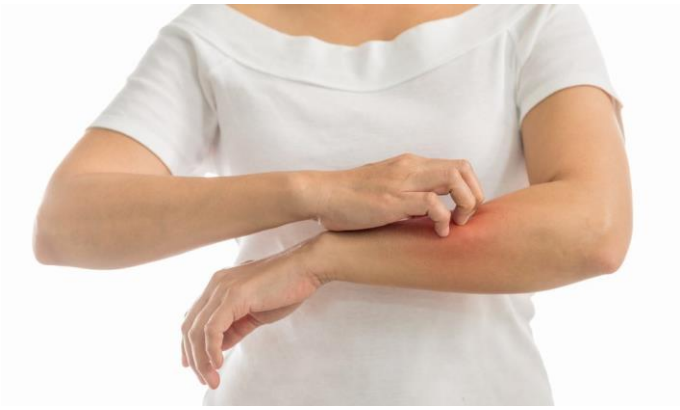
Regular assessments of the arteriovenous fistula flow (Transonic examination), as well as x-rays of the fistula, angioplasty, stenting, and revisions are to ensure the best function and longevity of the fistula.

Medical Side Effects of Haemodialysis

These are irritating, but mostly controllable with common sense and specific medicines.

Getting Dialysis right, tailored for you is important. The dialysis prescription and fluid removal will determine how well you are the next day. If you feel poorly, you have got it wrong!

Pruritis (itch)



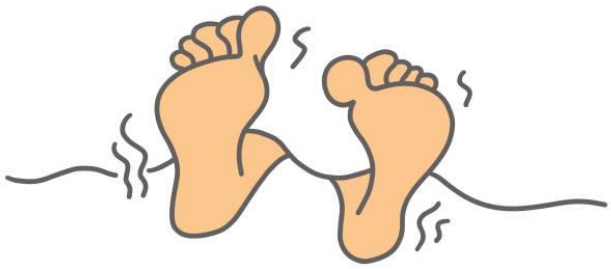
Pruritis is common and it has many origins.

Common causes are dry skin, and an excess of phosphate and parathyroid hormone in patient's system.

That issue may be dealt with by discussing monthly bloods with staff.

Frequently, pruritis has a more central (brain) origin, and may be ameliorated by medications, such as Pregabalin, and Gabapentin, or simply, by applying a moisturising cream to soothe the dry skin.

Restless legs



Restless legs are a common problem, especially at night, but also on dialysis.

Restless legs are distressing, particularly if responsible for kicking the bed covers off and, most importantly, preventing patient from a good night sleep.

Drugs used in Parkinson's Disease such as Madopar or Gabapentin, usually settle the problem. Alternatively, a transdermal patch (Neupro) is effective.

It is important to ensure that the iron status, particularly the ferritin level is satisfactory, asthat also is one of the correctable features.

Nausea

Occasionally, nausea could be experienced after dialysis and would last until late evening. This may interfere with the desire to eat.

This may be dealt with by taking Ondansetron, prescribed by the Kidney Doctor, to be taken immediately after the dialysis.

Cramp

Many Doctors are not old enough to have suffered cramp and have little idea of this agony.

During dialysis treatment, the patient is unable to stand up or stretch. Hopefully a member of staff will massage the torted calf muscle, but prevention is better.

Cramps occur frequently when patients are over dialysed, particularly if there is excess fluid removal.

The way to prevent this, is to put on no more than 2 L (2 kg) of body weight between dialysis treatments so that there does not have to be excessive fluid removal. This could be achieved by strict control of daily fluid intake.

Magnesium supplements are helpful but limited.

Quinine Bisulphate is effective in preventing cramp. Those patients who cramp frequently on dialysis, take the medication an hour before their treatment session.

Quinine Bisulphate is a safe medication, but many doctors don't use it.

Chronic tiredness

There is no cure for chronic tiredness on dialysis. It is part of the "territory". Therefore, it is important to make sure patient's internal medical parameters such as haemoglobin, iron levels, thyroid function tests are satisfactory, and the "figures", that indicate urea and creatinine are accepted as satisfactory.

Patient must be wary, that a complaint of chronic tiredness may be translated into "inadequate dialysis", resulting in an increase of time on dialysis.

If that occurs, it is advisable to run with it for one month or so and to see if it makes any difference. But if it doesn't, then revert back to the usual dialysis times. Always remember that increasing dialysis times often impacts on the family life and quality of life.

It could be expected that the tiredness is naturally minimised on the non-dialysing days. Anecdotal evidence shows that for some patients an exercise, such as a light gardening or a gentle walk on the fresh air for about a half an hour daily could help significantly.

It is also good to know, that the additional hours of sleep, outside the sleepless night times, bring surprisingly positive results when patients' overall energy levels are better for a longer time without an adverse impact on a nigh time sleep pattern.

Breathlessness

Breathlessness often means patient becomes volume overloaded. This may range from an excess of fluid in the lungs (common), to heart failure (rare).

This means, that the body is waterlogged! If this is the case, this needs to be brought to Staff's attention.

An early intervention is easy, but if fluid accumulates, removing volumes of fluid from the body may make person feel unwell, which may continue throughout the next day.

Constipation

Most patients may experience and complain of constipation but with time they learn to manage it.

A diet containing fibre and minimal Phosphate binders gives the best results. (See Diet and Phosphate sections as above).

Because the dialysis treatment desiccates, and patient is asked to restrict the daily fluid intake, constipation can evolve.

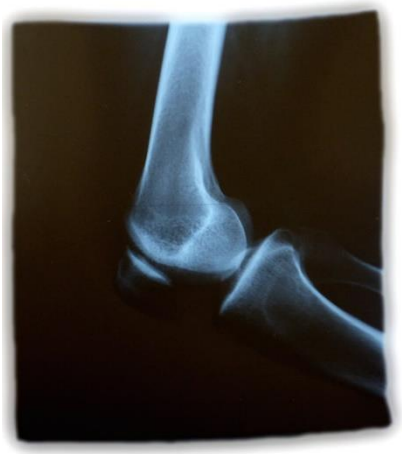
Bowel care is an ongoing business with dialysis patients and requires vigilance and management to avoid deeply unpleasant and in some circumstances dangerous consequences.

Regular Metamucil or some other medications used to relieve constipation such as Movicol or Coloxyl are safe and may be helpful.

In cases when medications may be changed, particularly if given a narcotic which may contain codeine, constipation can be a major side effect.

Phosphate binders (Renagel or Fosrenol) are also causing constipation.

Bone medicine



Patient's bone medicine is impacted a lot. Age, diabetes, family history of osteoporosis and **hyperparathyroidism** engendered by renal failure all diminish bones density.

Another side effect of dialysis is that the body is aging at five (**5) times** the usual rate.

Regular check-ups of patient's general internal medicine by the Kidney Doctor is very important. Usually that occurs every three (3) months.

BLOOD PRESSURE (BP)

Usual BP measurements are a BP~160 systolic going on Haemodialysis, and a BP~120 systolic the day after dialysis.

BP measurements may swing high and low after dialysis, reflecting the effects of volume removal on Dialysis,

.

Nursing staff are skilled handling this fluctuation.

Rarely is it a serious medical problem, and the important requirement is patience to allow the system to settle.

Controlling your fluid intake to gain weight no more than 2kgms between dialysis will massively help with BP problems and minimise the BP medication you have to take.

DAILY MEDICAL TOIL

Dialysis patients have all the usual afflictions of the common man. These include chest pain, blood pressure fluctuations, irregular pulse, chest infections, bronchitis and asthma, bowel vagaries, viral infections, painful joints, and the rest of it.

If any of these are of concern, they should be discussed with the Kidney Doctor at the three (3) monthly check-ups or at the earliest opportunity with unit nursing and medical staff.

Governance

Who Is in Charge of Dialysis?

The Kidney Doctor has input regarding the dialysis prescription.

Haemodialysis is managed by the unit nursing staff.

The day to day and functionality of the unit is vested in the Clinical Nurse Consultant who is managing the dialysis unit.

The Yorke Dialysis Clinic has quarterly meetings to assess clinical activity. These meetings involve a patient's Kidney Doctor. The meeting reviews standards of care, dialysis clinical activity and outcomes, and administrative problems, including complaints which have not been resolved.

Contempory review issues are fistula maintenance and surveillance, hypotension and cardiac stunning on dialysis, serial echocardiography (6^{th} monthly) to detect cardiac deterioration on dialysis.

Standards are maintained by analysis of Critical Incidents and workings that are in accord with International Fresenius Governance.

Whereas most dialysis units, particularly in the public system, operate on a rigid "Standard Operating Procedure", the Yorke dialysis unit has flexibility to meet individual patient needs. This Patient Centred approach is increasingly popular in Europe.

MEDICAL SURVEILLANCE

The Nephrologist is concerned regarding a patient's cardiovascular disease in particular, but also the general run of internal medicine, which includes a patient's whole body, especially brain, heart, diabetes, gut, LDL cholesterol etc, all are impacted from time to time by kidney failure and dialysis.

Careful management prolongs a patients' life, therefore, having many tests based on your internal medicine is common.