Acute Kidney Injury (AKI)
Undergraduate nurse education

Year One

Developed Summer 2017

THINK KIDNEYS

THINK KIDNEYS NHS

Think Kidneys is a national programme led by NHS England in partnership with UK Renal Registry

Overview

Basic A & P of:

- Urinary system
- Kidneys

Followed by:

- Introduction to Acute Kidney Injury

Urinary System

The urinary system consists of:

- 2 kidneys (usually!)
- Ureters
- Bladder
- Urethra

Urethra – Tube that leads from the bladder and drains urine out of the body. Features two sphincters – internal sphincter is involuntarily controlled while the external sphincter is voluntarily controlled.

Positioning of the Kidneys

Kidneys are bean shaped

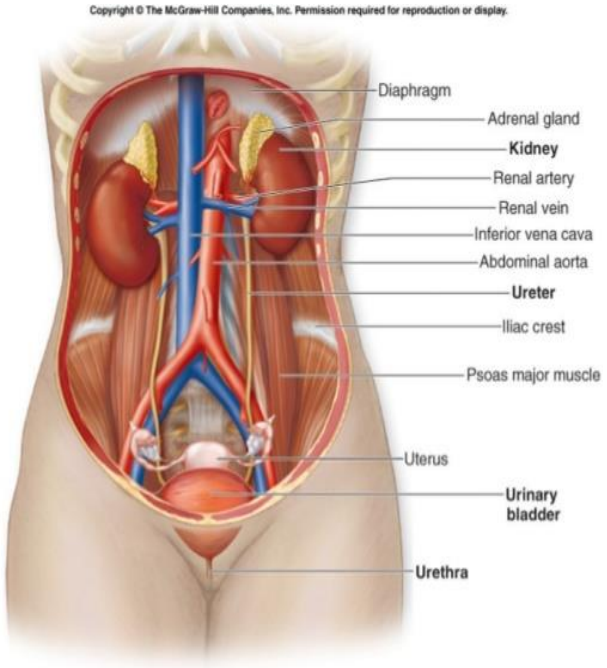
Located between 12th thoracic and 3rd lumber vertebrae

Right lies lower than left

Cushioned and held in place by fat, renal fascia & abdominal organs

Blood supply originates from the abdominal aorta and then the renal artery.

Blood travels away from the kidney via renal vein and then the inferior vena cava



Anatomy of the Kidney

- Surrounded by a tough fibrous capsule
- Renal Cortex – contains nephrons
- Renal medulla – loop of Henle and collecting ducts of the nephrons occupy this area
- Minor and major calyces collects urine and empties this into the renal pelvis
- Renal pelvis is a continuation of the ureter

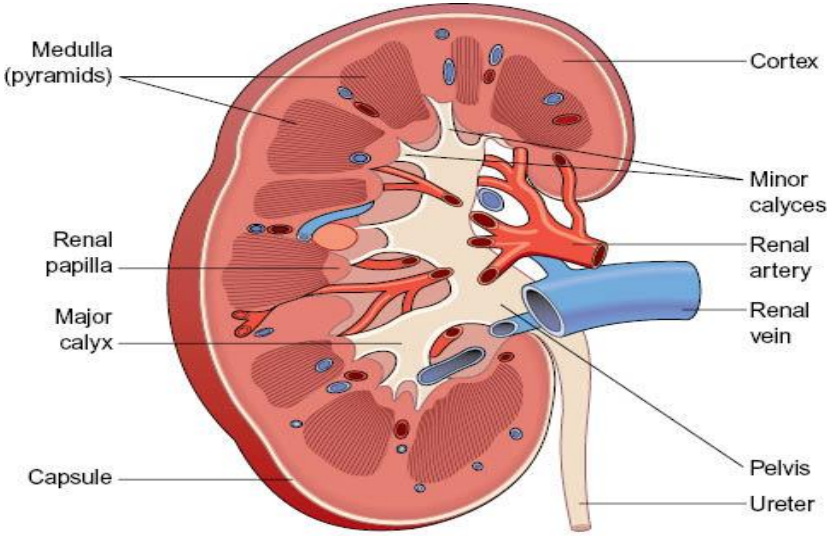


Figure 13.4 A longitudinal section of the right kidney.

Nephron

- Nephrons are the functioning units of the kidneys with approximately 1 million in each kidney.
- Glomerulus and glomerular capsule known collectively as the renal corpuscle – where filtration occurs.
- Proximal convoluted tubule (PCT) – reabsorption and secretion
- Loop of Henle – reabsorption of water (descending limb) and sodium (ascending limb)
- Distal convoluted tubule (DCT) – reabsorption, mainly facilitated by the presence of hormones
- Collecting duct – transports urine to calyces. Some reabsorption in presence of hormones
- Basic video on urine formation

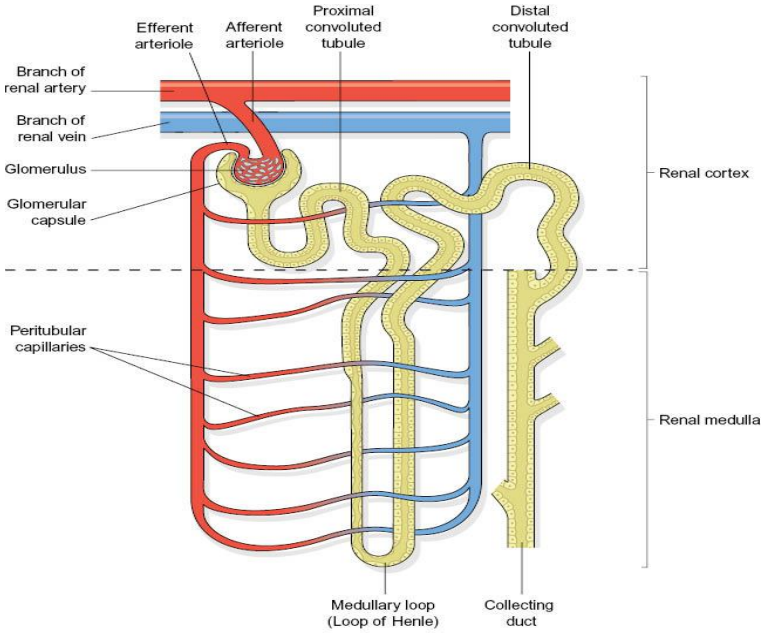
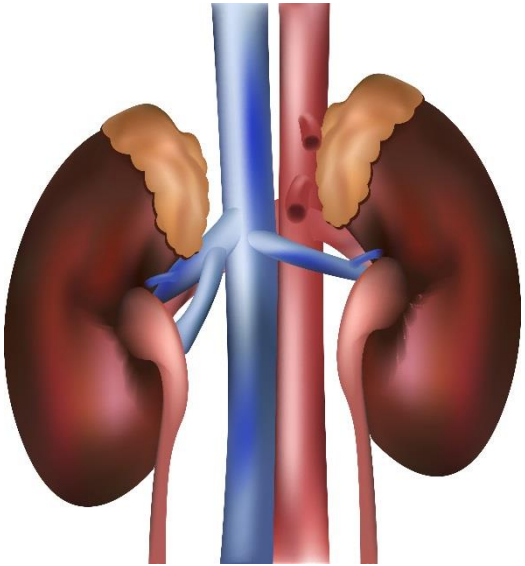


Figure 13.5 A nephron and associated blood vessels.

Key facts about the kidneys

- The kidneys require 25% cardiac output to be adequately perfused with blood and work effectively.
- Kidneys filter about 200 litres of fluid from the blood each day
- Most of this is reabsorbed – if it weren't, our vascular system would be empty of fluid within about 30 minutes!
- The kidneys don't just make urine, they have a number of other vital functions.
- Generally, people know very little about their kidneys – until something goes wrong.
- Think Kidneys video – almost everything need know about your kidneys



Functions of the kidneys

The kidneys have numerous functions and don't just produce urine

- Play a key role in regulating blood pressure
- Produce Erythropoietin that is vital in the production of red blood cells
- Maintains calcium and phosphate balance via the nephrons and through the activation of Vitamin D
- Maintain acid/base balance
- Maintain electrolyte balance, such as potassium and sodium
- Removal of waste products such as urea, creatinine, drugs and toxins

Kidney Dysfunction

- Kidney dysfunction can be seen as chronic or acute in nature
- Chronic Kidney Disease (CKD) is the gradual decline in renal function over months or usually years
- Acute Kidney Injury (AKI), formally known as acute renal failure, is the sudden deterioration of renal function over hours or days.
- People with CKD can also experience episodes of AKI – known as acute on chronic.
- People with CKD are most at risk of developing AKI

AKI

- AKI seen in up to 20% of all people admitted to hospital with older adults being particular affected
- AKI is increasingly being seen in primary care without any acute illness. About 65% of AKI starts in community.
- If AKI is highlighted early (community) this may prevent hospital admission or reduced length of stay.
- Financial burden to the NHS estimated between £420 million and £600 million per year
- (https://www.thinkkidneys.nhs.uk/aki/)

Risk Factors for AKI

- NICE guideline CG169 **(2013) focuses on the prevention, detection and management of AKI**
- **Identifies numerous risk factors – the main ones are summarised below:**
- Chronic Kidney Disease
- Age (above 65 years)
- Cardiac Failure
- Liver Disease
- Diabetes
- Nephrotoxic medications
- History of AKI
- Sepsis

Who is at risk of developing acute kidney injury?

- The prevalence of CKD and AKI increases with age. Between one-quarter and one-third of all adults aged over 64 years have CKD.
- The incidence of severe AKI is more than fifty times higher in people aged over 80 years than in people aged under 50 years.

- In addition to this, Think Kidneys (2015) suggest some individuals in the following groups can also be at risk of AKI in the primary care setting:
- Diabetics
- Dementia
- Heart failure
- Psychiatric patients
- Patients with cancer

Causes of AKI

- **The causes of AKI can be classified into one of 3 areas:**
- **Pre-renal:** Failure to receive an adequate blood supply (70%)
- **Renal:** Intrinsic damage to the kidney tissue (actual damage of renal cells, commonly referred to as ATN) (20%)
- **Post-renal:** Impaired renal drainage (obstruction of the renal tract) (5%)

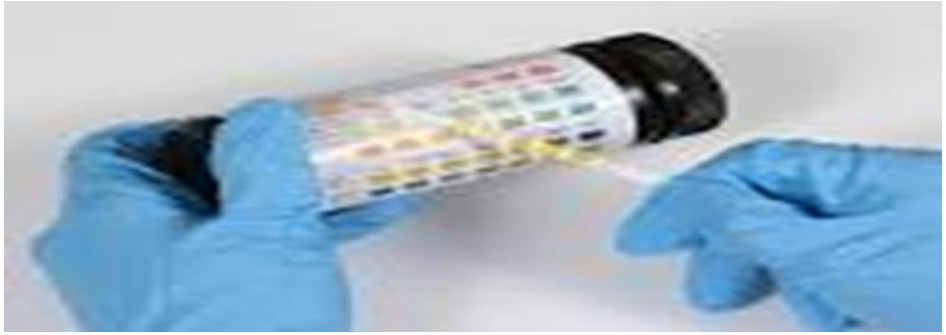
- Consider:
- Risk + Insult = increased risk of AKI
- **Example would be:**
- **Patient who is 68 years old, diabetic and has had a previous episode of AKI who has c. diff**
- Risk factors: Age, diabetes, previous AKI
- Insult: vomiting and diarrhoea due to c. diff. resulting in dehydration

Urinalysis

Assessment of urine can provide vital information as to whether the damage is within the kidneys or as a result of pre renal cause.

Blood and protein enter the urine if the filtration system within the kidneys is not working effectively.

2+ of blood or 2+ protein is a significant finding and should be reported to the doctor.



Think Kidneys public campaign summer 2016

Does your urine look like this?

1	2	3	4	5	6	7	8

If so, you need to drink more to keep your kidneys safe.
Healthy pee is 1 to 3, 4 to 8 you must hydrate.

Find out more at www.thinkkidneys.nhs.uk

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Visit www.thinkkidneys.nhs.uk
Or talk to your GP or pharmacist to find out more

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Dehydration

- Mild – no more than 5% of the body's fluid.
- Moderate is 5-10%
- Severe dehydration 10-15% is considered life threatening
- http://medical-dictionary.thefreedictionary.com/Dehydration
- It’s vital to monitor fluid input/output accurately
- Dehydration can be further compounded by continuation with diuretics and anti-hypertensives and other nephrotoxic medications.
- For further information regarding medications optimisation and AKI follow this LINK

How much should I drink?!

The Food Standards Agency (FSA) recommends that if you live in the UK (or somewhere with a similar climate), you should drink 1.2 litres (6-8) glasses of fluid every day

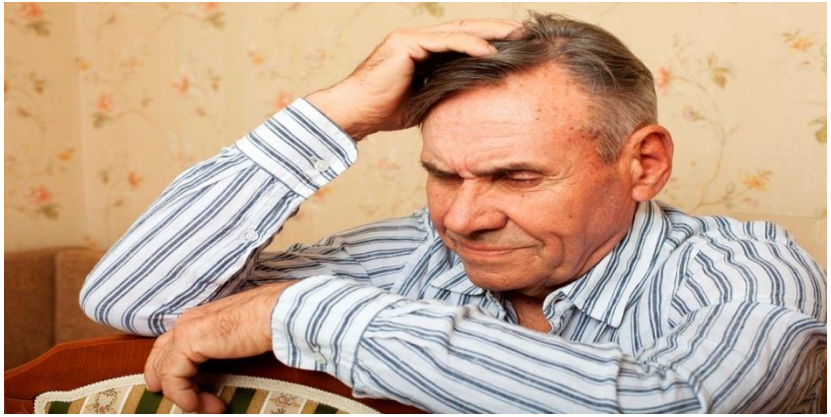
Age & Dehydration

Adults over the age of 60 who drink only when they are thirsty probably get only about 90% of the fluid they need. Developing a habit of drinking only in response to the body's thirst signals raises an older person's risk of becoming dehydrated.

Dehydration in children usually results from losing large amounts of fluid and not drinking enough water to replace the loss. This generally occurs in children who have stomach flu. An infant can become dehydrated only hours after becoming ill.

Signs of dehydration

- Thirst
- Dark urine
- Sunken eyes
- Irritability
- Confusion
- Cool hands or feet
- Low blood pressure
- Raised heart rate
- Headaches
- If a person has AKI they may pass less urine than usual (oliguria), or pass no urine at all (anuria)



Clinical Signs of Dehydration

Other symptoms may include:

- Dizziness or light-headedness or confusion
- Headache
- Tiredness
- Dry mouth, lips and eyes
- Passing small amounts of urine infrequently (less than three or four times a day)
- Loss/ deterioration of strength and stamina
- Muscle cramps
- Reduced appetite
- Pressure area break downs
- Constipation

Treating Dehydration

The best way to treat dehydration is to rehydrate the body by drinking plenty of fluids, such as water, semi-skimmed milk, diluted squash or diluted fruit juice.

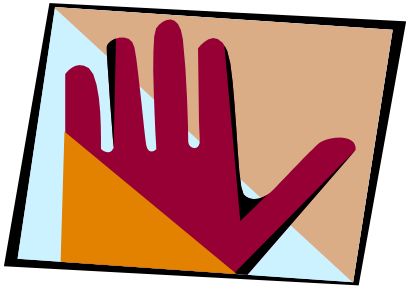
Suspect Dehydration?

- What clinical signs are present?
- Assess Respiratory rate, BP, Temperature and pulse
- Feel limb temperature, assess skin turgor, feeling thirsty, any oedema?
- Look inside the mouth for dry mucous membranes
- Ask when they last passed urine?
- Note (if able – volume, colour, smell and clarity)
- Look for any acute illness
- Look at the prescription chart / medications

Prevention is better than cure

Up to 30% AKI maybe preventable by:

- volume replacement
- discontinuing and/or avoiding certain potentially nephrotoxic agents
- earlier recognition of conditions causing rapid progression of AKI
- Correctly completing and acting upon Early Warning Scores



Summary

- The kidneys have numerous functions and when they fail, this has complex and life-threatening consequences
- AKI is the sudden deterioration of kidney function over hours or days
- AKI is often preventable
- Older patients, those with chronic diseases such as CKD, diabetes and heart failure are at high risk of AKI
- AKI has numerous causes that may be pre, intra or post renal in nature
- Dehydration is a major cause of AKI