Aims & Outcomes

The aim of this module is to facilitate student learning regarding the need for, and how to carry out a basic urinalysis test.

The learning outcomes are for the student to be able to:

✔ Describe the need for a urinalysis test.
✔ Discuss how to obtain a specimen of urine from the patient.
✔ Consider the steps required to carry out a simple urinalysis test.
✔ Carry out a basic urinalysis test in a simulated or clinical setting.
✔ Evaluate own knowledge of urinalysis and formulate an action plan to compensate for any deficits.
Introduction

Urinalysis is a common investigative procedure which may aid a diagnosis. A relevant patient history and appropriate further investigations should be performed if an abnormal result is obtained. Urinalysis provides results within minutes and may aid the detection of a number of diseases including:

- Diabetes
- Renal Stones
- Urinary Tract Infection

Urinalysis is a three step procedure. This three step procedure is usually performed by nursing staff. However, if you need to undertake this procedure, please adhere to the guidance within this module.
Introduction

Step 1
A urine sample is first collected.

Step 2
A simple dipstick test is performed on the collected urine sample.

Step 3
Further more detailed analysis may be required if an abnormality is discovered.
Step 1 – Collection of urine sample

The urine sample is usually collected from the patient a `mid stream specimen` technique.
Urinalysis

Step 1 - Mid stream specimen equipment

Gather equipment for the patient

- Urine collection pack
- 1 bowl with gauze balls for cleaning
- 1 bowl for collection of the sample
- Optional single use funnel
- Urine collection pot
Urinalysis
Patient Communication

Patient Communication

**ICE**

**Introduce yourself**
- Give your name, clinical title and the reason why you have come to see the patient (e.g. Hello my name is .. I am a junior doctor and ...........)  

**Check patient identification**
- Check addressograph details on request form with the patient
- Ask the patient, if they are able, to tell you their: full name, date of birth & address
- If an in-patient check hospital ID band with request form  

**Explanation**
- Explain procedure to patient, include reason for the procedure and that if any abnormality is identified further investigations may be necessary. Include benefits, risks, what will be done to minimise risks and why the benefits outweigh the risks
**Urinalysis**

**Patient Communication**

**BENEFITS**

- Obtain sample to aid diagnosis
- Obtain sample for comparison with previous results to monitor progress

**RISKS**

- Infection
- Abnormality detected thus further investigations required
- Unable to obtain sample

**ACTION TO MINIMISE RISK**

- Using a technique which includes good skin cleaning preparation
- Having a competent practitioner to perform urinalysis
- Ensure urine sample performed within set time or refrigerated as per local policy

**Informed Consent**

Gain verbal informed consent

**Wash hands, apply PPE and gather equipment**
Urinalysis
Step 1 - Procedure (Collecting mid stream specimen)

**Step 1 -Procedure (Collecting mid stream specimen from an adult)**

- Give patient sterile collecting pot
- Explain importance of an uncontaminated sample
- Explain contents of the pack
- Ensure patient washes hands
- If necessary instruct to clean external urethral meatus using gauze balls, soap and water
- Men and boys should retract the foreskin with one hand. Women should part the labia with thumb and forefinger
- Explain that the initial flow of urine should be voided in to the toilet
- The mid stream must be collected in the bowl taking care not to touch the inside of the pot to avoid contamination. This is known as the mid stream specimen
- Once there is enough urine in the collection bowl voiding is completed in the toilet
- Wash hands
- Single use funnels may be available for both males and females
Urinalysis
Step 1 – Procedure (Urine collection from urinary catheter)

**Step 1 - Procedure (Urine collection from a urinary catheter)**

- Wash hands
- The catheter bag tubing should have a sampling port. Clean port with alcohol wipe and left to dry for 30 seconds
- Use a sterile needle and syringe to withdraw 20ml of urine from catheter tubing
- Clamping of the tubing may be necessary for a short while if no urine is in the tube
- Transfer urine to specimen container
Urinalysis

Step 1 - Procedure (Paediatric urine collection)

- It may be difficult to obtain an uncontaminated urine sample from infants, babies and young children.
- There are three methods available:
  - ‘Clean catch’ - The sample is obtained by sitting the baby/child over a sterile receptacle.
  - ‘Bagged sample’ – A sterile perineal collecting bag is attached to the perineal area ensuring that the urethra is within the sealed area.
  - ‘Emergency, suprapubic bladder aspiration’ - This method is only considered as a last resort.
Step 2 – Testing with a dipstick

The sample is then tested with a urine dipstick. The dipstick is a long thin plastic strip which is made up of one or a number of squares of chemical reagents. Once dipped in urine these squares react to molecules within the urine sample and change colour depending on the presence and concentration of these molecules. A dipstick may test for just one molecule or for all of the below.

- Bilirubin
- Leucyocytes
- Blood
- Nitrites
- Glucose
- Protein
- Ketones
- Urobilinogen

The pH and specific gravity may also be identified.

False positives may occur if the urine sample is left to stand for a prolonged time period or if contamination occurs.
Step 2 - Procedure  (Preparation of dipstick equipment)

- Don plastic apron
- Wash hands
- Wear non-sterile gloves
- Collect urine sample using one of the methods stated in previous slides
Urinalysis
Step 2 – Procedure (Testing with dipstick)

- Test sample within 2 hours. Otherwise refrigerate sample
- Don gloves
- Check expiry date on dipstick container
- Take a strip from container. Ensure it is not discoloured and replace the lid
- Dip strip into urine ensuring all coloured reagent blocks are soaked in urine
- Remove excess urine by sliding the strip along the edge of the container
- Lie the strip flat on a paper towel
- Wait 60 seconds or relevant time indicated on reagent strip instructions
Step 2 - Procedure (Dipstick results)

- Hold strip against container comparing the standarised chart with the sample strip
- Record results
- Discard strip, gloves and apron appropriately. Wash hands
Step 2 - Procedure Point of Care Testing

If using a urinalysis machine to obtain the results:
Some clinical areas will have a machine, also known as a urinalysis analyser, that will evaluate the urine and provide a print out of the results. This is known as Point of Care Testing or POCT.

Important note:
You must not use a POCT machine unless you have received specific training for doing so.

Overview
After removing the excess urine from the test strip place the strip onto the tray. The machine will retract the tray, analyse the urine and then eject the tray and strip. Remove the strip and clean the tray. Tear off your patient’s printed results and ensure the patient’s details are added before sticking the results in the medical notes.

NOTE: Ensure you are using test strips compatible with the machine.
Step 2 - Interpretation  Causes of urine colouration

- **Orange/brown**: Liver failure, metronidazole, ingesting carrots
- **Red**: Frank haematuria, lead or mercury poisoning, rifampicin – pink, ingesting beetroot or rhubarb
- **Green/Blue**: Urinary tract infection (pseudomonas), hypercalcaemia, amitriptyline
- **Colourless**: Excessive fluid intake, diabetes insipidus, diuretics
**Facts About The Test Strip**

<table>
<thead>
<tr>
<th>Label</th>
<th>Colour</th>
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<tbody>
<tr>
<td>Leukocytes</td>
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<tr>
<td>Nitrite</td>
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<td>Protein</td>
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<td>pH</td>
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<td>Specific Gravity</td>
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<td>Ketone</td>
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<td>Glucose</td>
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</table>

**Instructions:** Click a colour on test strip on the left to reveal further information.

**IMPORTANT:**
Colours used in this test strip are only intended as an indication of observed results, as colour reproduction will vary between computers.
Leukocytes

The presence of leukocytes may indicate a urinary tract infection (UTI) or more severe renal problems. However, they may be present without bacterial infection (sterile pyuria).

Instructions: Click a colour on test strip on the left to reveal further information.

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Nitrites

The presence of nitrates is associated with infection. Most organisms that are responsible for UTI’s convert nitrate to nitrite.
Protein

Albumin proteins are too large to pass through the glomerular filtrate barrier, so a presence may indicate an increased permeability due to infection or renal damage.

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**Facts About The Test Strip**

**pH**

The pH of urine is normally acidic. A pH range of 5.0-8.0 is considered normal. High acidity may indicate kidney stones. Alkalinity may indicate the presence of certain bacteria such as Pseudomonas, Klebsiella or Proteus mirabilis. A protein rich diet can also make the urine more acidic, whilst a vegetarian diet may show alkaline results.

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### Urinalysis

#### Facts About The Test Strip

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<thead>
<tr>
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<th>Instruction</th>
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<tr>
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<td>pH</td>
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<tr>
<td>Blood</td>
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<tr>
<td>Specific Gravity</td>
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<td>Ketone</td>
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<tr>
<td>Glucose</td>
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#### Blood

The presence of blood in the urine is abnormal. It is associated with problems in the urinary tract such as urological disease and/or infection. Check that a female patient is not menstruating before rushing to send the sample for further testing.
Facts About The Test Strip

- **Leukocytes**
- **Nitrite**
- **Protein**
- **pH**
- **Blood**
- **Specific Gravity**
- **Ketone**
- **Glucose**

**Specific Gravity**

A measure of the total solute concentration. Normal is 1.001-1.035. A high value may indicate the patient is dehydrated. High levels of a solute—such as glucose will raise specific gravity levels. Low value represents dilute urine—occurs when patient has diabetes insipidus or hypercalcaemia.

**Instructions:** Click a colour on test strip on the left to reveal further information.

**IMPORTANT:**

Colours used in this test strip are only intended as an indication of observed results, as colour reproduction will vary between computers.
Ketones

These are acidic chemicals formed during an abnormal excessive breakdown of fat. This can occur if there is a prolonged period of vomiting, fasting, starvation, and poorly controlled diabetes mellitus.
Glucose

The renal threshold is 10-11mmols. If elevated, may indicate abnormal blood sugar levels or reduced renal threshold, due to diabetes mellitus. Raised levels can also occur during pregnancy and in those taking corticosteroids.
Urinalysis
Step 2 - Interpretation

General appearance
A fresh urine sample is straw coloured, transparent and free from debris

Odour
Fowl smelling – May indicate an infection or dehydration
Sweet smelling – May indicate ketoacidosis

pH
Urine is normally acidic (pH 4.5-7)
Increased acidity – high meat diet, dehydration, diabetic ketoacidosis, renal stones
Alkalotic – vegan diet, chronic renal failure, bacterial urinary tract infections

Specific gravity
Urine specific gravity measures the concentration of molecules in urine. Normal range 1.003-1.030
Lower values – urinary dilution in diabetes insipidus, renal failure, excessive fluid intake
Higher values – urinary concentration in shock and dehydration
Interpretation

Potential causes of abnormal findings

Blood
Blood in the urine may be caused by
Renal – glomerulonephritis, polycystic renal disease, renal cancer
Extra-renal – urinary tract infection, kidney stones, hypertension, sickle cell disease
Positive results may also appear in trauma and in menstruating females

Protein
Proteinuria may be present in urinary tract infections, pre-eclampsia, intrinsic kidney dysfunction

Nitrites and Leukocytes
Present in urinary tract infection

Glucose & ketones
Diabetes, pregnancy, Cushings disease, pancreatitis, intrinsic kidney disease
If an abnormal result is identified, further investigation may be required.
The sample should be sent as soon as possible to the relevant laboratory.
Otherwise, store the sample in a specimen fridge overnight.
Red top bottles containing the preservative boric acid are useful if no fridge is available.
Label the sample bottle with the patient details and place in an appropriate sample bag.
Complete the investigation form (e.g., Microbiology form for culture and sensitivity).
Step 3 – Procedure (Completing request form)

Completed microbiology request form
You must document the procedure in the patients medical notes. Your entry must include:

- Date & time
- Verbal consent obtained
- Type of urine sample obtained
- Any abnormalities detected
- Whether further investigations were performed such as sending a urine sample for culture and sensitivity
- Information given to patient
- Your signature, job role and bleep/extension number. If you work in a Trust which provides staff ID stamps you must also add this.
Avoid first void of the day as urine stasis may give a false reading

- Current evidence does not support the need for cleansing the external urethral meatus prior to urine collection, however take note of local policy and clinical judgment

- Store strips in a cool dry place

- Read instructions on reagent strip container to ensure correct time is allowed before reviewing results

- Time accurately

- Do not contaminate reagent strip with fingers
References


